EMI 8800

DIGITAL TAPE TRANSPORT AND FORMATTER

USER MANUAL

Document Ref : CM.1028 Issue 1

EMI SE Labs

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EMI 8800 MODEL No................

SERIAL No...............

EQUIPMENT MODIFICATION RECORD SHEET

ASSEMBLY	DESCRIPTION	MODIFICATION STATE	HANDBOOK AMENDMENT
	WRITE DATA BOARD		
79980	12.5, 18.75 i.p.s. PCB Assy.		
78570	45, 37.5, 25 i.p.s. PCB Assy.		
	READ DATA BOARD		
79001	45 i.p.s. PCB Assy.		
79021	37.5 i.p.s. PCB Assy.		
79041	25 i.p.s. PCB Assy.		
79061	18.75 i.p.s. PCB Assy.		
79081	12.5 i.p.s. PCB Assy.		
	HEAD ASSEMBLY		
78988	9T Head Assy.		
78989	7T Head Assy.		
79381	9T (Read Only) Head Assy.		
79382	7T (Read Only) Head Assy.		
79383	9T Hard Head Assy.		
79384	7T Hard Head Assy.		
	MOTORS		
78786	Motor Assy. (Supply) Indirect Drive		
78787	Motor Assy. (Take-up) Indirect Drive		
79229	Motor Assy. (Supply) Direct Drive		
79228	Motor Assy. (Take-up) Direct Drive		
78769	Capstan Motor Assy.		
	SWITCH FASCIA		
78667	9T Switch Fascia Assy.		
79378	7T Switch Fascia Assy.		
79377	9T Switch Fascia Select Assy.		
79379	7T Switch Fascia Select Assy.		
	SERVO		
79120	Servo PCB Assy.		
78758	Arm Position Sensor Assy.		
78921	Servo Heatsink Assy.		
	MECHANICAL		
79981	Mechanical Kit (Standard)		
79983	Mechanical Kit (Basic)		
78818	Arm Mounting Assy.		
78870	Arm Drive Assy.		
79140	Hub Assy.		
	MICRO-DIAGNOSTICS		
79316	Micro-diagnostics Transport Assy.		
79406	Micro-diagnostics Formatter Assy.		
	POWER UNIT		
78600	Power Unit Assy.		
79470	Power Unit Formatter Assy.		
	FORMATTER		
79250	Formatter PCB Assy.		
79400	Formatter Mounting Kit		
79371	Formatter Rack Mounting Box and Power Unit		
	OPTIONS		
79233	Elapsed Time Indicator		

USER MANUAL (ISSUE 1) AMENDMENT RECORD SHEET

AMENDMENT No.	DETAILS	DATE

PREFACE

This manual outlines the various features and capabilities of the tape transport in sufficient detail to facilitate its operation. A companion manual, CM.1029 — EMI 8800 Tape Transport Servicing Manual, provides full functional and circuit descriptions and routine servicing and preventative maintenance procedures.

Associated Documentation:
CM.1030: EMI 8800 Micro-diagnostics Manual.
CM.1031: EMI 8800 Dual Formatter Manual.
OS023: EMI 8800 Tape Transport Product Specification.
OS024: EMI 8800 Dual Formatter Product Specification.

ECMA-5: Data interchange on 7-track magnetic tape.

ECMA-12: Data interchange on 9-track magnetic tape at 32 bits/mm (800 b.p.i.).

ECMA-36: Data interchange on 9-track phase-encoded magnetic tape at 63 bits/mm (1600 b.p.i.).

UL114-1975, UL478-1975: UL requirements for electronic data processing equipment.

IEC 435: International Electrotechnical Commission, safety of data processing equipment.

CSA C22.2 No.154: Canadian Standards for Data Processing Equipment.

VDE 0875/7.71: Verband Deutscher Elektronicer, RFI Suppression.

BS 800: Radio Interference Limits and Measurements.

BS 4503 Part 1: Specification for 9-track magnetic tape for data interchange at 800 rows per inch.

BS 4503 Part 2: Specification for 9-track magnetic tape for data interchange at 1600 rows per inch phase-encoded.

ANSI X3.2.1/425: Recorded magnetic tape for information interchange (200 c.p.i., NRZ1 9-track).

ANSI X3.2.1/426: Recorded magnetic tape for information interchange (800 c.p.i., NRZ1 9-track).

ANSI X3.2.1/400: Recorded magnetic tape for information interchange (1600 c.p.i., phase-encoded, 9-track).

ANSI X3.2.1/420: Unrecorded magnetic tape for information interchange (9-track 200 and 800 c.p.i., NRZ1, and 1600 c.p.i. phase-encoded).

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1. INTRODUCTION

The EMI 8800 series of digital magnetic tape transports is designed for use with 0.5in. computer tape for digital recording. Electrical and physical compatibility with similar industry-standard equipment is incorporated into the design.

The transport is a modular rack-mountable machine, designed for high reliability, low cost and short mean-time-to-repair. It produces NRZ1 (non-return-to-zero) or PE (phase encoded) tapes, compatible with IBM, ECMA, ANSI and BSI magnetic tape recording formats, using 0.5in computer grade magnetic tapes of up to 10.5in reel diameter. 9-track NRZ1, PE or dual versions, and 7-track NRZ1 versions are available at speeds ranging from 12.5 to 45 i.p.s.

The EMI 8800 transports utilise a tension arm method for buffering tape, and an arm drive mechanism for easy tape loading is available. A microprocessor is employed to provide sequential control, interlocks and diagnostic functions within the transport.

A Micro-diagnostics unit is built into the transport; it is accessible from the front and provides complete off-line checks.

A single-board dual NRZ/PE Formatter can be mounted on the rear of the transport and powered from the transport power unit. The Micro-diagnostics capability may be extended to include Formatter operation.

A single Formatter can interface up to 8 transports in a daisy-chain configuration.

A range of computer interfaces is available; information for these is covered in separate documents.

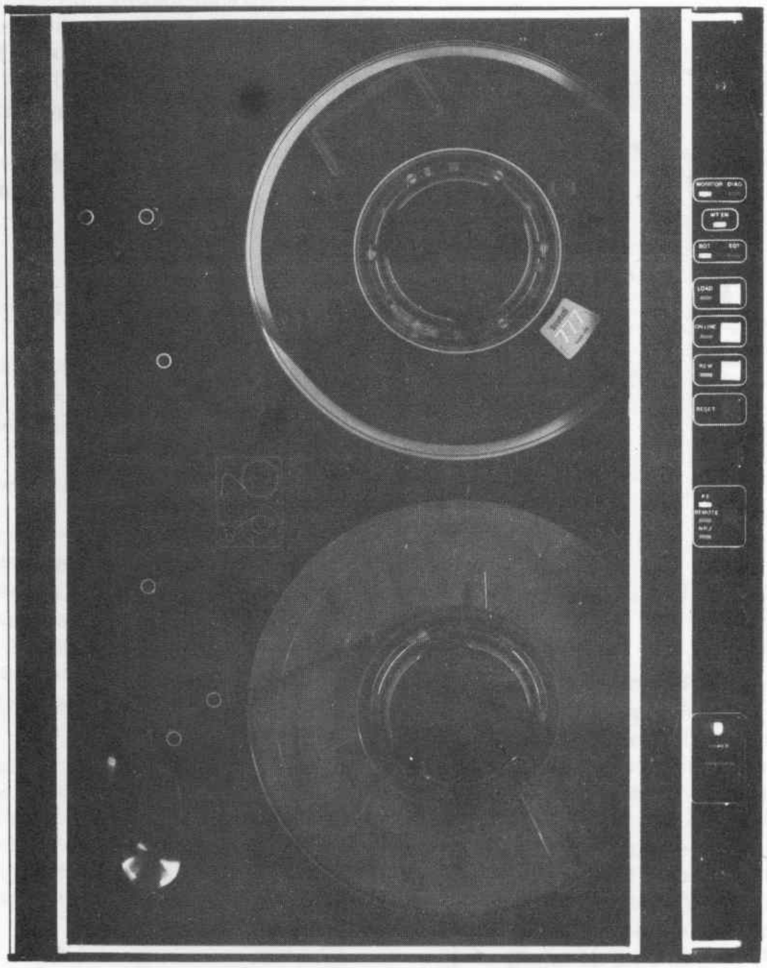


Fig. 1.1 EMI 8800 TAPE TRANSPORT: GENERAL VIEW

2. INSTALLATION AND INITIAL CHECKOUT PROCEDURES

2.1 UNCRATING AND INSPECTION

2.1.1 Tape Transport Uncrating (Fig. 2.1)

(a) General

Tape transport packaging consists primarily of a tubular transit frame bolted to a wooden pallet with an outer covering of heavy-duty cardboard, held by straps.

An auxiliary outer box is used for air freight and any other long-distance shipments.

(b) Uncrating

(i) Remove primary pack from air-freight outer box (if applicable).

(ii) Cut straps and remove accessory pack and manuals complete with accessory carton (Fig. 2.1.(A)), located beneath the top covering (B).

(iii) Lift the cardboard covering up and away from the tape transport and frame (D).

(iv) Remove door protector (E).

(v) Remove the three nuts and washers from the three coach bolts and lift the tape transport complete with frame (D) clear of the pallet (C) and power unit support pad (F).

CAUTION: The weight of the tape transport complete with frame is approximately 50kg (110lb), two persons will therefore be required for the lifting operation.

2.1.2 Inspection

After uncrating, the contents will be found to include:

(a) Tape transport mounted in transit frame.

(b) An accessory pack consisting of:

(i) Unterminated mains supply lead with moulded socket (plug must be added).

(ii) An alternative voltage selector and anti-surge fuse (if required).

NOTE: The tape transport will normally be fitted for 240V operation, unless requested otherwise at the time of order.

(c) Instruction Manuals

(i) CM.1028 — EMI 8800 Digital Tape Transport and Formatter User Manual.

(ii) CM.1030 — EMI 8800 Micro-diagnostics Manual (if applicable).

After the tape transport has been uncrated it should be visually checked for any damage that may have occurred during transit. All items should be checked off against the packaging check list, which accompanies each system. Check also that the options fitted to the transport are in accordance with the order.

2.2 TAPE TRANSPORT INITIAL CHECKOUT AND OPERATING PROCEDURES

The tape transport should be checked for basic operation, preferably before rack mounting. To check, carry out the procedures of Sections 2.2.1 and 2.2.2.

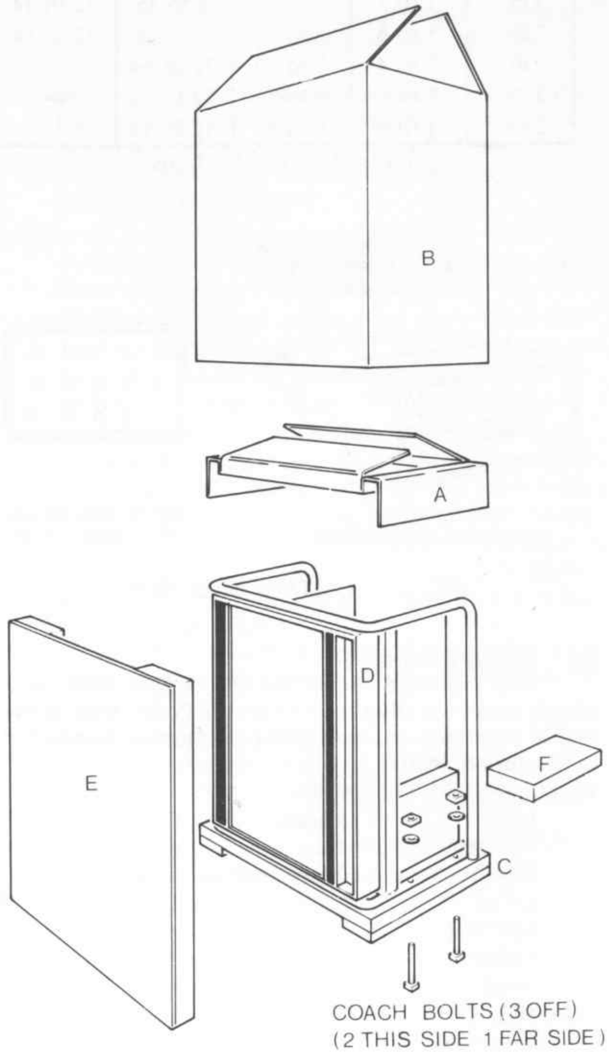


FIG. 2.1 TAPE TRANSPORT PACKAGING

2.2.1 Power Supplies

(a) Supply Voltage

Ensure that the correct voltage selector plug compatible with the input supply voltage to be used, is fitted. Voltage selector plugs available are: 110V, 115V, 120V, 220V, 230V and 240V, 50-60Hz.

To change the voltage selector: disconnect the supply lead from the input socket, release the voltage selector retaining tab (Fig. 2.2) and unplug selector. Insert the required selector and check the fuse rating. (Refer to (b) overleaf and change fuse, if necessary).

CAUTION: Voltage selectors are fixed assemblies. Jumper wires must not be removed. Voltage changes must only be catered for by substitution of voltage selector or by re-wiring and re-labelling by authorised personnel.

(b) Supply Fuse Rating

(i) For 110/115/120V models, FS1 is a 5A anti-surge fuse.

(ii) For 220/230/240V models, FS1 is a 3A anti-surge fuse.

Voltage	Link Pin Nos.			
110	1 to 4	2 to 10	5 to 15	12 to 14
115	1 to 7	2 to 11	5 to 15	12 to 14
120	1 to 8	2 to 9	5 to 15	12 to 14
220	1 to 4	5 to 10	12 to 14	—
230	1 to 7	5 to 11	12 to 14	—
240	1 to 8	5 to 9	12 to 14	—

Jumper Wire Connections

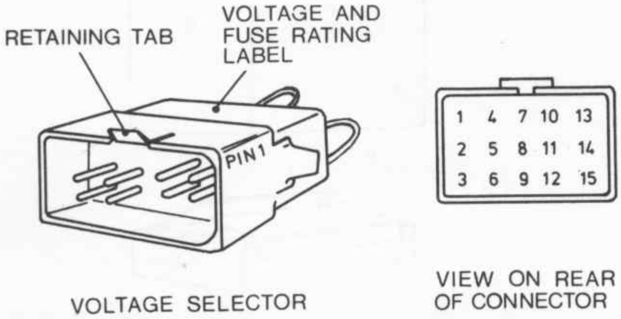


FIG. 2.2 VOLTAGE SELECTION

(c) Supply Connection

The moulded socket on the supply lead fits a chassis-mounted plug located on the Power Unit at the rear of the transport. A suitable plug must be connected to the supply lead.

Terminations:

LIVE	Brown
NEUTRAL	Blue
EARTH	Green/Yellow
LIGNE	Brun
NEUTRE	Bleu
TERRE	Vert/Jaune
LINIE	Braun
NEUTER	Blau
GRUNDE	Gelb/Gruen

NOTE: 2-pin plugs are not suitable. The earth wire must be 'grounded' for safety reasons.

To assist with the wiring of US 3-pin plugs the following information is provided:

LIVE (Brown) = Black (US) — flat silver pin
NEUTRAL (Blue) = White (US) — flat gold pin
EARTH (Green/Yellow) = Green (US) — half-round gold pin.

2.2.2 System Operation

The initial system operation is checked by carrying out the following procedures:

(a) Systems without Micro-diagnostics

(i) Switch on in accordance with Section 3.3.

(ii) Lace tape in accordance with Section 3.4.

(iii) Load tape to BOT in accordance with Section 3.5.

(iv) Using the Test FWD/OFF/Test REV switch (Section 4.3.1) and the REW, ON LINE and RESET switches (Section 4.2, Table 4.1), check the basic tape functions.

around:

(v) Unload tape in accordance with Section 3.6.

(b) Systems with Micro-diagnostics

(i) Perform the routines of (a).

(ii) Perform the fixed 'program stacks' routines of programs 90 and 91 (refer to Section 4.4.4 and also CM.1030 — EMI 8800 Micro-diagnostics Manual).

NOTE: On dual (NRZ/PE) tape transports ensure that (b)(ii) is repeated for the other mode (NRZ or PE).

On the satisfactory completion of these check-out procedures the tape transport may be removed from the transit frame and rack-mounted as described in Section 2.2.3 following.

2.2.3 Tape Transport Rack Mounting (Fig. 2.3)

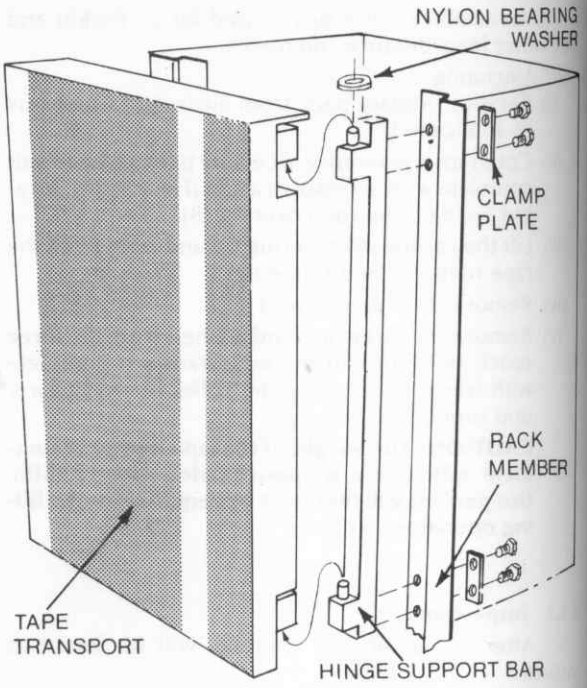


FIG. 2.3 TAPE TRANSPORT RACK MOUNTING CONFIGURATION

(a) Equipment Rack

It is essential to ensure that the equipment rack has either a low centre of gravity with the transport installed or, alternatively, has forward protruding feet. This precaution is necessary to prevent 'toppling' when the transport is hinged out. The hinge support bar (Fig. 2.4) strengthens the rack and prevents twisting of the hinges and resultant sagging of the transport.

It is recommended that the rack must be adequately ventilated and that a ventilation panel be fitted at the top. If the temperature 5 cm (2 in) behind the servo heat sink, at the rear of the Servo board, does not exceed 45 deg C (transport operating worst case) then forced cooling is not required.

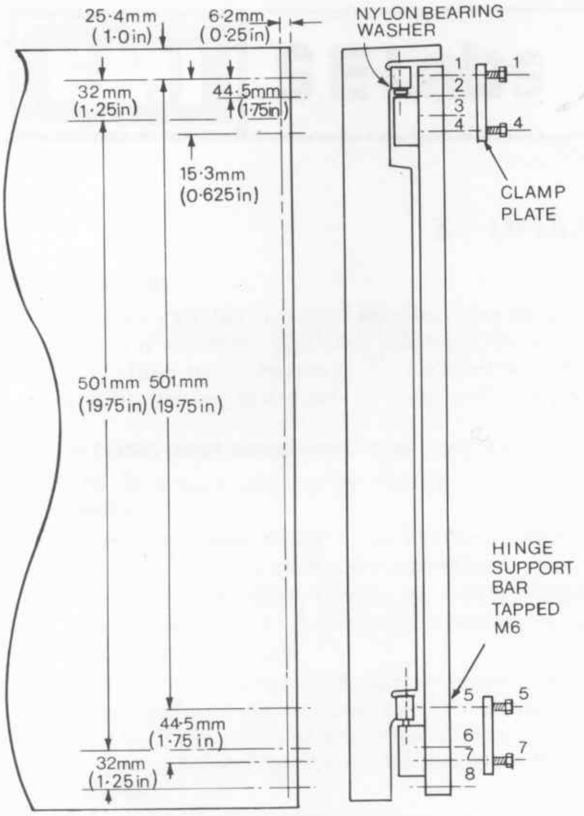
(b) Tape Transport Rack Mounting Procedure

Fig. 2.5 shows the overall dimensions of the complete tape transport assembly.

To install the transport in the equipment rack proceed as follows:

(i) Disconnect and remove the mains supply lead.

(ii) Remove the tape reel and ensure that all the printed circuit boards within the transport are correctly installed.



NOTE – HOLE POSITIONS 1 AND 4 (TOP), 5 AND 7 (BOTTOM) ARE RECOMMENDED WHEN RACK MOUNTING BUT ALTERNATIVELY, ANY PAIR OF HOLE POSITIONS (1-4 TOP), (5-8 BOTTOM) CAN BE USED

FIG. 2.4 HINGE SUPPORT BAR AND FIXING DETAILS

(iii) Remove the M8 transit bolt from the rear of the transport casting (located above and to the right of the capstan motor). Remove the two posts which fix the transit bolt mounting plate to the frame. Set aside the transit bolt mounting plate, to be used to secure the transport to the rack if further transportation is required after rack mounting.

(iv) Open the transport dustcover door by pressing the door release catch, located to the left of the transport casting. Using a screwdriver (pozidrive), release the transport latch by turning the transport latch screw anti-clockwise until the latch moves to the open position.

WARNING: Due to dimensions and weight of the transport care should be taken when lifting it clear of the frame (two persons required). Select lifting position with care, i.e. do not use the capstan motor as a lifting point.

(v) With the help of the second person, hinge the transport open and lift clear of the hinge pins. Place the transport upright on a flat surface.

(vi) Remove the hinge support bar from the transit frame and position it on the equipment rack as required. Details of the hinge support bar, together with hinging details are given in Fig. 2.4.

(vii) Each fixing position utilises two pairs of 6mm bolts. The use of clamp plates is recommended if the rack mounting holes are too large for the 6mm bolts. Ensure that a nylon bearing washer is fitted to the upper hinge pin. Tighten the bolts securely.

(viii) Employing three persons (two to lift, one to guide) present the transport to the equipment rack, in the fully open position.

NOTE: To provide a useful lifting point it is recommended that the Micro-diagnostics unit be removed.

Locate the transport on the top hinge pin of the hinge support bar and then lower and align the transport to the lower hinge pin. Replace Micro-diagnostics unit.

(ix) Close the transport and ensure that sufficient clearances exist and that the transport sits squarely in the equipment rack.

(x) Connect the supply lead to the transport and ensure interface connections are made to SK101, 102, 103 or SK1, 2, 3 as required. Secure the interface looms to permit hinging of the transport.

(xi) Lock the transport in the closed operational position by turning the transport latch screw clockwise (pozidrive screwdriver). The transport is now ready for use.

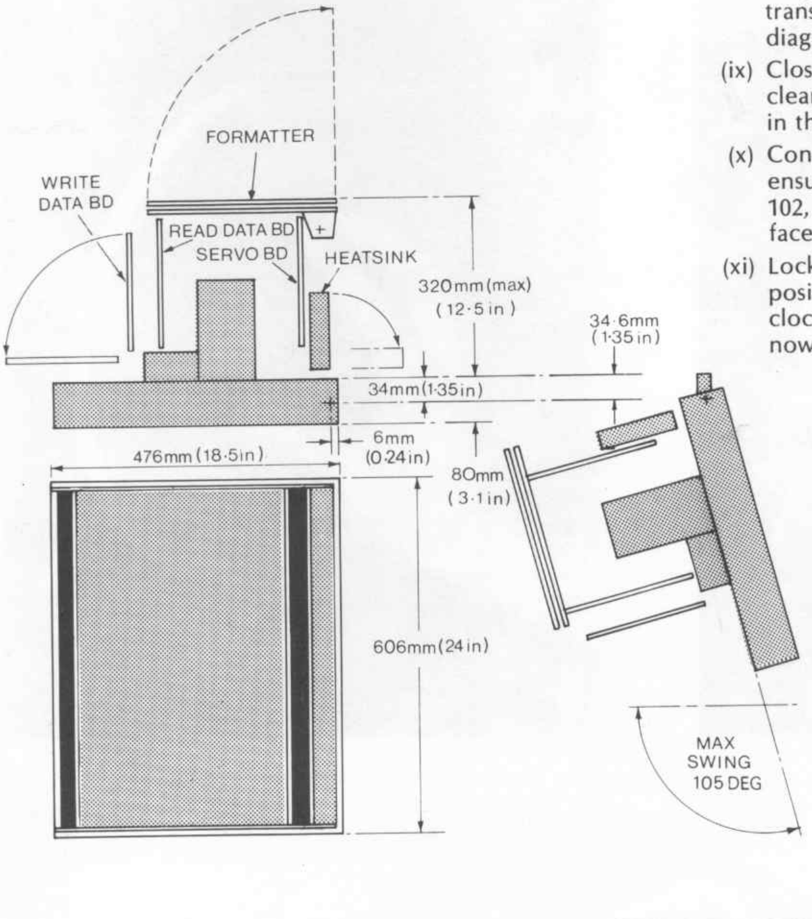


FIG. 2.5 TAPE TRANSPORT: OVERALL DIMENSIONS

3. OPERATING PROCEDURES

3.1 GENERAL

Before carrying out the following operating procedures, it is recommended that reference be made to Section 7 (Tape and Transport Care), particularly to those paragraphs relating to the care of tapes and tape paths.

3.2 FITTING AND REMOVING THE TAPE REEL

(a) To fit a tape reel to the transport, proceed as follows:

- (i) Press the release catch on the left hand side of the transport, and open the transport door.
- (ii) Ensure that the Write Enable ring is either fitted to permit writing or, if required, removed to safeguard existing data.
- (iii) Present the tape reel to the upper (supply) hub and exert pressure on the inner part of the reel, pushing until the reel is locked in position by the three toggle catches (Fig. 3.1(a)). **Do not press the reel flanges.**

(b) To remove a tape reel from the transport upper (supply) hub, proceed as follows:

- (i) Steady the tape reel outer flanges with both hands.
- (ii) Press the central hub-release plate with both thumbs (Fig. 3.1(b)).

NOTES (1): If, under abnormal circumstances, the toggle catches have been pushed in on an empty hub, the hub-release plate can be pressed to return the catches to the position which enables a tape reel to be fitted.

(2): If necessary, for maintenance purposes, the lower (take-up) spool can be removed in a similar manner to the upper (supply) reel.

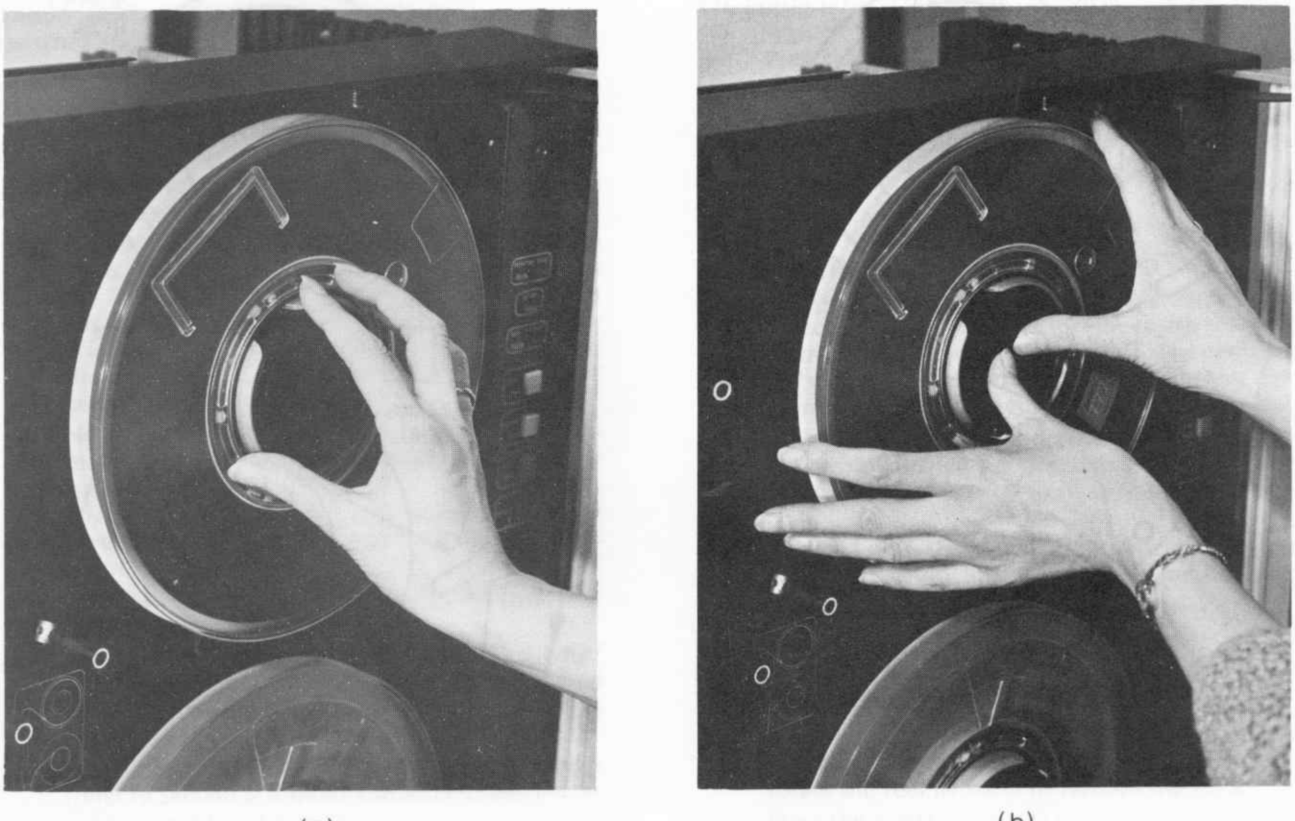
3.3 SWITCHING ON PROCEDURE

WARNING: Care must be taken when operating the tape transport with the casting hinged out, as supply wires run from behind the mains switch to the transformer.

To switch the tape transport on proceed as follows:

(a) Set the POWER switch to on and check that the adjacent red (or optional green) neon indicator is illuminated.

(b) Check that the green MONITOR indicator illuminates within 1s from switch on. Illumination of the MONITOR l.e.d. signifies that the system has successfully completed the initial self-test routine, i.e. power supply rails are correct, internal and external (formatter) connections have been validated, and the transport microprocessor has completed its self-test routine. If MONITOR does not



(a) (b)

FIG. 3.1 TAPE REEL FITTING AND REMOVING

illuminate, refer to Section 4.3.4 for maintenance indicators.

(c) If the Write Enable ring is fitted to the upper (supply) reel, check that the WTEN (Write Enable) amber l.e.d. indicator is illuminated.

(d) Select NRZ/REMOTE/PE mode as necessary, and check that the associated amber l.e.d. is illuminated.
NOTE: The mode can be selected at any stage prior to the transport being set ON LINE.

3.4 LACING THE TAPE

NOTE: Before loading tape, ensure that the tape path is clear (clean with soft lint-free cloth if necessary). Refer also to Section 7.

3.4.1 Arm Drive

Refer to Fig. 3.2 or the tape lacing diagram positioned on the transport fascia panel to the right of the head covers. Proceed as follows:

(a) Ensure that both tension arms are in the driven position, ready for tape loading (Fig. 3.2).

(b) Withdraw a short length of tape (approx. 20 cm) from the upper (supply) reel.

(c) Guide the tape over the top two fixed rollers and below the upper tension arm roller.

(d) Feed the tape down through the head cover slot and then round the capstan.

(e) Route the tape over the lower tension arm roller below the two fixed rollers onto the lower (take-up) spool, guiding the tape to the right of the spool between the flanges. Allow the tape to drop over the spool and, using the finger holes provided, wind the tape on three turns of the take-up spool. Finally, check that the tape is taut and correctly located over the head and rollers.

(f) Close the transport dustcover door. The tape is now ready for tensioning.
NOTE: If, for maintenance purposes, the dustcover door is to be left open, the door safety switch, located at the top right of the transport, must be overridden (Section 4.3). With the door open, the LOAD sequence is inoperative until this is done.

3.4.2 Non-Arm Drive

Refer to Fig. 3.3 or the tape lacing diagram on the transport fascia panel to the right of the head covers. Proceed as follows:

(a) Withdraw a short length of tape (approx. 20 cm) from the upper (supply) reel.

(b) Hold the end of the tape and pull along the tape path, over the first fixed roller, and around the underside of the upper tension arm roller.

(c) Guide the tape to the right and over the second fixed roller and then feed through the head cover slot and around the underside of the capstan. Ensure that the tape is located properly over the head and across the fixed guides.

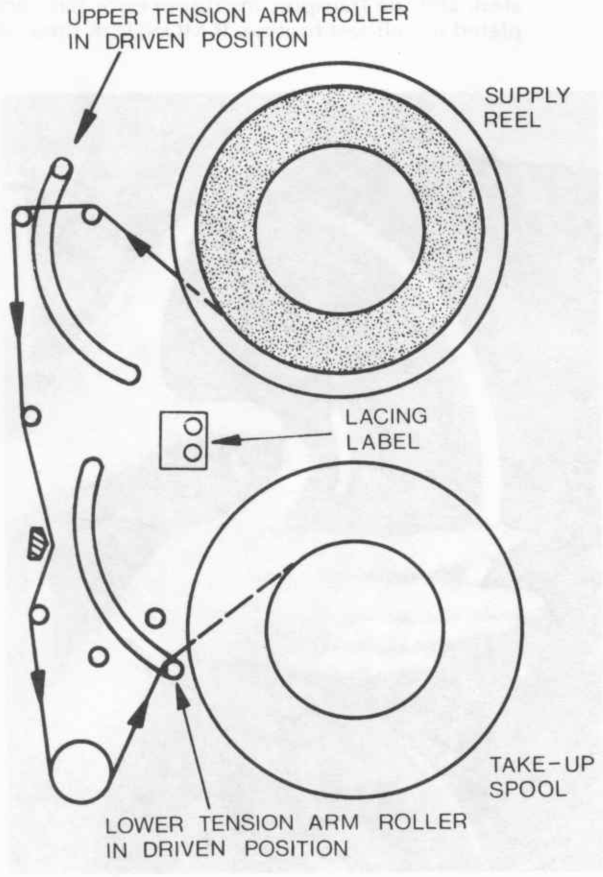

UPPER TENSION ARM ROLLER IN DRIVEN POSITION
SUPPLY REEL
LACING LABEL
TAKE-UP SPOOL
LOWER TENSION ARM ROLLER IN DRIVEN POSITION

FIG. 3.2 LACING — ARM DRIVE

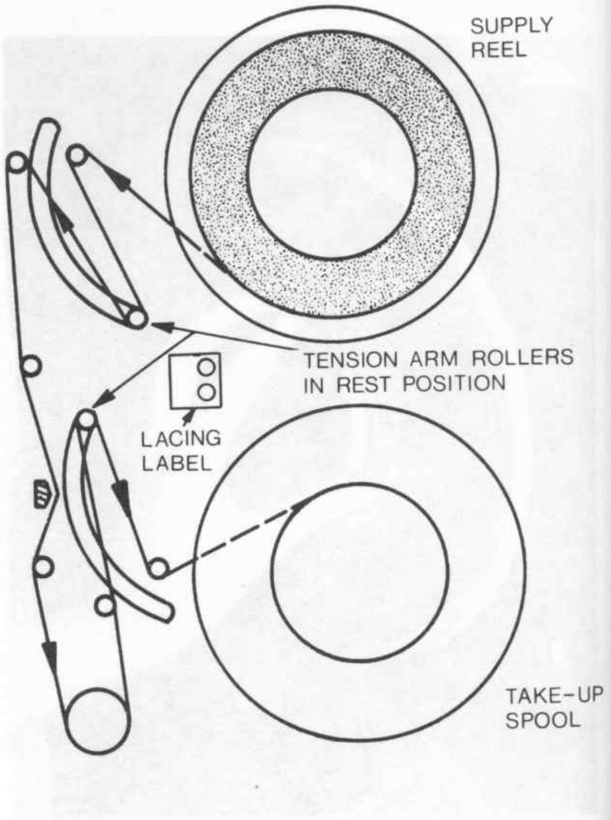


FIG. 3.3 LACING — NON-ARM DRIVE

(d) Route the tape to the right of the next fixed roller, over the top of the lower tension arm roller and down to the left of the fixed roller adjacent to the lower (take-up) spool.

(e) Guide the tape over the take-up spool flange and rotate the spool clockwise whilst retaining the tape to the flange, by hand. Rotate the take-up spool until both tension arms reach their relaxed position, if necessary rotating the supply spool by hand.

(f) When the tension arms are at rest, lower the tape so that it falls between the right hand flanges of the take-up spool. Using the finger holes provided in the take-up spool, wind a further three turns of tape onto the take-up spool, again assisting supply spool rotation by hand, if necessary.

(g) When the tension arms are at, or nearly at, rest, withdraw hands and check that the tape is correctly laced and, in particular, is not slack or straddling a roller flange.

(h) Close the transport dustcover door. The tape is now ready for tensioning.
NOTE: If, for maintenance purposes, the dustcover door is to be left open, the door safety switch, located at the top right of the transport, must be overridden (Section 4.3). The LOAD sequence is inoperative until this is done.

3.5 TAPE LOADING TO BOT (Beginning Of Tape)

The object of every normal load procedure is to set the tape transport ON LINE at LOAD POINT (LDPT) when the BOT reflective marker is opposite the sensor.

IMPORTANT: Before tensioning, remove any tape slack by manually rotating the tape reel, and visually check the tape path.

Ensure DIAG indicator is extinguished, maintenance switches are set to off, and the dustcover door is closed.

To load tape to BOT proceed as follows:

(a) Press the transport LOAD push-button once, to cause the transport servos to be energised and the tape to be tensioned.
CAUTION: Once the tape is tensioned, the tape tension arms must not be touched.

(b)(i) **Arm Drive** — The arm drive mechanism retracts to allow the tension arms to take up the tape between the fixed rollers. After the arm drive mechanism has fully retracted the transport servos are energised and the tape is tensioned. After a 1s delay, the tape is automatically run to LDPT and the BOT green indicator is illuminated.

(ii) **Non-Arm Drive** — After a 1s delay the tape is automatically run to LDPT and the BOT green indicator is illuminated.

NOTE: The LOAD amber indicator is illuminated during the above sequence until the BOT indicator is illuminated.

(c) Before the tape transport is set ON LINE check the following:

(i) In the case of dual tape transports, the NRZ/REMOTE/PE mode switch is set to the required position and the associated amber indicator is illuminated.

(ii) When the SELECT (Transport Selected) option (refer to Section 8) is fitted, the SELECT switch is set to the correct unit number.

(d) Press the transport ON LINE push-button and check that the associated amber indicator is illuminated. ON LINE may be set at any time following the LOAD command.

3.6 UNLOADING TAPE

CAUTION: The transport dustcover door must be closed before an UNLOAD sequence can be initiated. If it is necessary to unload with the door open, the door safety switch must be overridden — the following then applies. Never depress the hub release plate whilst tape is tensioned. This could cause the high power spool motors to spin the hub. The tape should only be removed when all the tape has been fully wound onto the supply reel.

To unload tape carry out the following procedure:

(a) Press the transport RESET push-button to set the transport OFF LINE.

(b) If the tape is positioned forward of BOT, press the REWIND push-button (associated REWIND amber indicator illuminated) and allow the tape to return to the BOT position.

(c) With the tape at BOT, press the REWIND push-button, which causes the unload sequence to be entered. The tape is reversed until tension is lost; the supply reel slowly continuing to rotate until the tail of the tape is wound on the supply reel.

Once the unload sequence is initiated the transport dustcover door can be opened without interruption of the sequence.

NOTES (1): If the unload sequence is commenced inadvertently it can be cancelled by pressing the RESET push-button, and the tape is returned to BOT by pressing the LOAD switch.

(2): The tension arms are positioned close to the end stops during an unload sequence, to facilitate gentle tape handling the moment tape tension is lost.

(3): If arm drive is fitted, the tension arms are driven to the load position when tension is lost.

(d) Press the supply reel hub ejector plate and remove the reel of tape (Fig. 3.1). Close the transport dustcover door.

(e) For tape protection, place the reel of tape in a dust proof cover and store in a safe place.

3.7 SWITCHING OFF WITH TAPE LACED

Except where static (parking) brakes are fitted as an option (Section 8) always ensure that the tape is returned to BOT, or unload before switching off. The reels are provided with a dynamic braking effect to prevent tape loops forming following servo shutdown.

With parking brakes fitted, the tension arms maintain tape tension. When parking brakes are not fitted, the tension arms are allowed to relax to their rest position.

Arm Drive: The presence of tape is detected by use of the BOT/EOT sensor, and the arm drive mechanism is not activated.

3.8 TENSIONING TAPE FOLLOWING SWITCH OFF

(a) Check the tape path, in particular around the roller flanges. In the unlikely event of tape slack, rotate the reel by hand to remove the slack.

(b) Press the transport LOAD push-button to initiate the LOAD sequence. Tape will then start running forward in search of BOT. After approximately

17 m (56 ft) of tape has been traversed the forward search is cancelled and rewind is automatically commenced.

If EOT is found during the LOAD sequence, REWIND will commence immediately. The LOAD sequence can be cancelled at any time by pressing the RESET push-button. Provided BOT has not been found, the LOAD sequence can be restarted, REWIND can be initiated, or ON LINE can be set.

3.9 TRANSPORT FAILURE

In the event of a transport failure, the equipment must be switched off immediately. Possible causes of transport failure or loss of tape tension are:

(a) Mains supply interruption: Attempt to re-tension the tape in accordance with Section 3.8.

(b) Servo fault.

(c) Tape running off at EOT: Caused by either a fault in the controller or program, or failure of the EOT detection circuitry.

(d) Failure to see BOT reflectivity marker: Caused by a transport fault.

(e) If the arm drive mechanism fails, it is possible to continue operation (without the arm drive facility) provided the drive mechanism is in the 'rest' position. To achieve this position with a partly-functioning arm drive mechanism, lace the tape, switch on, close the door, press LOAD and the arms will retract. When the arms are almost retracted, switch the power off.

To disable the arm drive mechanism, disconnect SKAD from the left hand side of the Servo board, the transport will then operate without arm drive (refer also to Section 3.4.2).

4. CONTROLS AND INDICATORS

4.1 GENERAL

4.1.1 Operator Function

(a) Tape Tensioning

Tape tensioning and setting the transport ON LINE, is normally an *operator function* and can only be achieved remotely, via TAPE INPUT LOAD ON LINE (TILOL) if Link 15 (LK15) is fitted to the Servo board (Fig. 4.2).

If the tape is to be written on, a 'Write Enable' ring must be fitted to the supply reel and the WTEN indicator illuminated when the reel is loaded. Many computer programs are not entirely foolproof and may indicate parity errors or bad tape whilst attempting to write on a file protected tape.

Conversely, if the tape is to be *file protected*, it is an *operator function* to ensure that the 'Write Enable' ring is not fitted and that the WTEN indicator is not illuminated. **Pre-recorded information will be at risk if these conditions are not satisfied.**

The operational function of all the tape transport controls, maintenance switches and Micro-diagnostic controls are described in the following sub-sections.

(b) Door Interlock

The EMI8800 is fitted with a door interlock as a safety precaution.

When the door is opened, tape motion is halted, tape tension maintained, and ON LINE reset. ON LINE, LOAD and REWIND/UNLOAD sequences cannot be engaged with the door open.

The door interlock can be overridden (Section 3) for maintenance purposes, but is ineffective for the Micro-diagnostic or maintenance controls.

NOTE: When the low speed UNLOAD sequence is initiated, the door can be opened without halting tape motion.

4.2 TAPE TRANSPORT CONTROLS AND INDICATORS

Fig. 4.1 shows the transport control panel in detail and table 4.1 defines the function of each control and indicator.

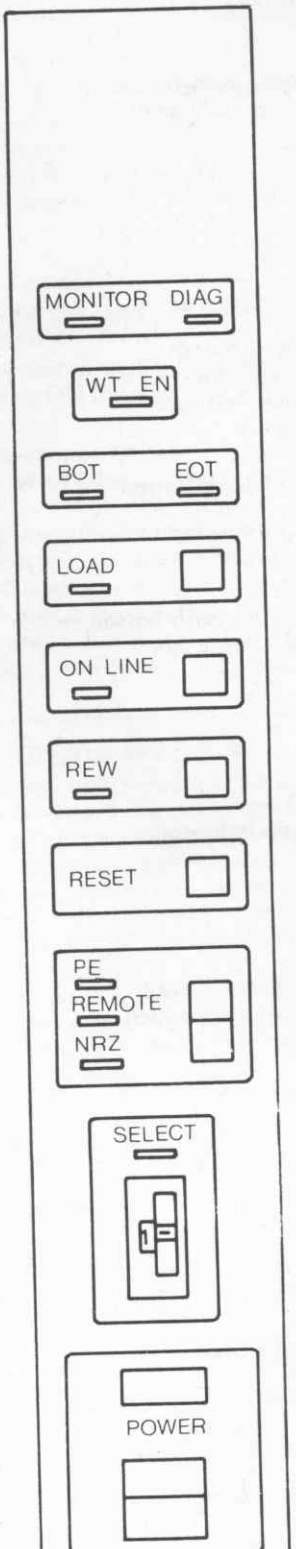


FIG. 4.1 TAPE TRANSPORT CONTROL PANEL

TABLE 4.1
TRANSPORT CONTROL AND INDICATOR FUNCTIONS

CONTROL INDICATOR	FUNCTION
POWER switch — Red or Green neon indicator	A double-pole switch which controls the supply to the tape transport power unit. The red or green indicator illuminates when the switch is ON and power is connected.
LOAD push-button — Amber indicator	This tensions the tape and initiates the LOAD sequence; the associated amber indicator is illuminated during the LOAD sequence. The button is inoperative with the dustcover door open. After tensioning, the tape is transported forward at sync speed and, if after approximately 17 m (56 ft) of tape, BOT has not been detected, or if EOT is seen, the transport automatically rewinds and the sequence is completed after a forward approach to BOT (at LOAD point).
REW (Rewind) push-button — Amber indicator	This initiates a REWIND or UNLOAD sequence, but is inoperative when the transport is ON LINE. An UNLOAD sequence commences when REW is pressed with the tape at BOT.
RESET push-button	Operation of RESET cancels LOAD, REWIND, or UNLOAD sequences, and sets the transport OFF LINE. When UNLOAD is cancelled, BOT may be regained by pressing LOAD.
ON LINE push-button — Amber indicator	This sets the transport ON LINE and the associated indicator is illuminated. When ON LINE, all remote outputs and inputs of the transport are enabled. ON LINE status may be set during a LOAD sequence, although inputs and outputs automatically remain disabled until BOT.
BOT — Green indicator	The indicator is illuminated when the tape BOT marker is positioned at the BOT sensor. This is known as LOAD POINT.
EOT — Red indicator	The indicator is illuminated when the tape EOT marker is positioned at the EOT sensor.
PE/REMOTE/NRZ Mode select switch — Amber indicators	This 3-position switch performs the following: (a) When set to NRZ the NRZ1 recording format is selected and its associated indicator is illuminated. (b) When set to PE the PE recording format is selected and its associated indicator is illuminated. (c) When set to REMOTE (centre position) remote mode selection is permitted and the transport follows the formatter commands. Both the REMOTE indicator and either NRZ or PE indicator are illuminated to indicate the selected mode. *NOTE: An interlock is available and is selectable on the Servo board DIL switch SW1 (Section 4.3.5).* *Without interlock, NRZ or PE is selectable at any time by manual or remote selection. With interlock, when ON LINE, any operation of switch is ignored; indicators remain in originally selected mode, normal switch selection is resumed when OFF LINE.* For single mode transports, the switch has no effect and the appropriate NRZ or PE indicator is illuminated; although the centre position of the switch illuminates REMOTE, the mode remains fixed.

CONTROL INDICATOR	FUNCTION
	Two links (refer to Section 4.3.6) may be removed from the Servo board to enforce REMOTE selection only, so that the switch has no effect and the REMOTE indicator is illuminated together with either NRZ or PE indicator as appropriate.
WTEN (Write Enable) — Amber indicator	This indicator illuminates when a tape reel is loaded to a hub having a 'Write Enable' ring fitted.
MONITOR — Green indicator	This indicator is illuminated when the initial system self-tests have been completed, to indicate that the system is functional. The self-tests include power supply checks, internal and external connector validation checks, and the self-testing of the microprocessor (refer also to Section 5.5.6).
DIAG — (Diagnostics) — Red indicator	This indicator is illuminated when: (a) The Test FWD/OFF/Test REV switch of Section 5.3 is set to either Test FWD or Test REV. (b) When the Micro-diagnostics unit is fitted and its ON/OFF switch is set to ON (refer also to Section 4.4). *NOTE: The transport cannot be set ON LINE or unloaded from BOT when DIAG is illuminated.*
SELECT — Green indicator together with transport select switch	These are optional and are intended for multi-transport operation where it is desirable to alter a transport address easily. Address 0-7 is selectable by the thumb-wheel switch, and the indicator is illuminated when the formatter selects the transport. For a multi-transport system, each transport must be set with a unique address.

4.3 MAINTENANCE CONTROLS AND FACILITIES

NOTE: **Transport Door Interlock — Override**
The interlock switch (Section 4.1.1(b)) can be overridden for servicing by pulling the probe forward; the override is reset when the door is closed.

It is not necessary to override the door interlock in order to use the maintenance switches or the Micro-diagnostics unit.

The following maintenance switches (the locations of which are shown in Fig. 4.2) and facilities, are provided within the system:

4.3.1 Test FWD/OFF/Test REV Switch

This 3-position switch (centre position: OFF) is located on the Servo board (Fig. 4.2) and, when selected, causes the tape to move in either the forward or reverse direction at the synchronous speed. Test FWD or Test REV is operative only when the transport is OFF LINE. Provision is made to stop the drive automatically, at EOT in the FWD mode, and at BOT in the REV mode. When either Test FWD or Test REV is selected the DIAG indicator, on the front panel, is illuminated. If the transport is ON LINE, the DIAG indicator acts as a warning that the switch is 'active'.

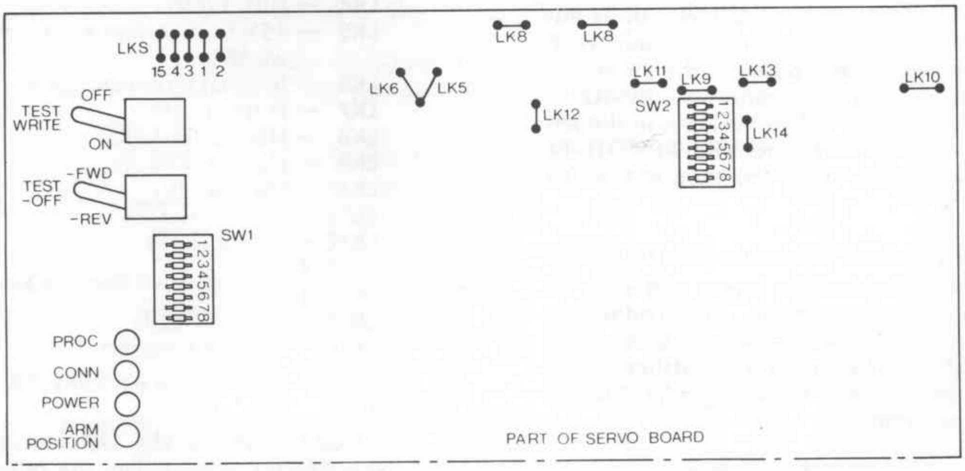


FIG. 4.2 SERVO BOARD: TEST SWITCHES, INDICATORS AND LINK POSITIONS

4.3.2 Test Write Switch

This switch is located on the Servo board (Fig. 4.2) and, when used in conjunction with the Test FWD switch (Section 4.3.1), enables a fixed 'All 1's' pattern to be written on the tape for either NRZ or PE recording formats, according to the mode selected. This is useful during servicing, particularly for setting the read amplifier gains. As with the Test FWD/OFF/Test REV Switch, the Test Write Switch is operational only in the OFF LINE condition.

4.3.3 Capstan Strobe

When the Test FWD/OFF/Test REV Switch is set to Test FWD, a microprocessor controlled l.e.d. strobes a disc mounted on the capstan. This is used for fine speed setting-up of the transport, and obviates the need for external illumination. The strobe frequency is set, automatically, to suit the required tape speed as determined by the Read Data board.

NOTE: If the Read Data board is disconnected, the transport servos and the strobe revert to 45 i.p.s.

4.3.4 Maintenance Indicators

If the front panel MONITOR indicator fails to illuminate after switch-on, the three l.e.d. indicators (PROC, CONN and POWER) located on the Servo board (Fig. 4.2) should be examined. During correct operating conditions, all three l.e.d.'s and the MONITOR indicator will be illuminated.

(a) If the POWER indicator is not illuminated, one or more of the power lines have failed and the d.c. fuses should be checked.

(b) If the PROC indicator is not illuminated, the microprocessor self-test routine has not been completed successfully.

(c) If the CONN (Connector Validation) indicator is not illuminated, a connector is not inserted. Note that there are two connector validation loops (Section 4.3.5).

The ARM POSITION l.e.d. indicator (Fig. 4.2) can be used to test the arm limit sensors. The indicator is illuminated when either arm is at its limit.

4.3.5 Dual In Line (DIL) Switches

(a) SW1

Position 6 — Dual Mode Select Interlock

For either NRZ/PE/9T or Hiden/Loden/7T an optional microprocessor interlock can be enabled by the use of this switch position. With SW1/6 in the right hand position, the mode will change whenever the front panel NRZ/REMOTE/PE switch is operated. When SW1/6 is in the left hand position, the front panel NRZ/REMOTE/PE switch is ineffective whilst the transport is ON LINE.

Position 7 — Formatter Connector Validation (CV).

CV on the formatter inputs can only be achieved through the ribbon cable connectors (SK1, SK2 and SK3). If the alternative edge connector inputs (J101, J102 and J103) are used then the CV loop must be inhibited by setting SW1/7 to the right hand position.

Position 8 — Remote Unload Option.

This switch (SW1/8) concerns the OFF LINE-REWIND-UNLOAD input (SK1/18) or (J101/L). When SW1/8 is in the left hand position the input command sets the transport off line. When SW1/8 is in the right hand position the input command sets the transport off line, rewinds the tape, and unloads.

(b) SW2 (Transport Address).

These switches (Positions 1 to 8 inc.) set the Transport Address 0-7, only one switch being set to the right hand position. The switch positions are allocated as follows:

SWITCH POSITION	TRANSPORT ADDRESS
1	SELECT 2
2	SELECT 3
3	SELECT 5
4	SELECT 4
5	SELECT 6
6	SELECT 7
7	SELECT 0
8	SELECT 1

If the thumbwheel switch SELECT option (Section 8) is fitted to the front panel, all SW2 switches must be set to the left hand position (i.e. inactive).

4.3.6 Servo Board Links

In general these links are provided to enable alternative pin allocations, so that full compatibility can be achieved with other systems. These only concern SK (J101) since SK1 is specific to the EMI 8800 and, in any case, contains all options.

For full details of link options refer to CM.1029 — EMI 8800 Tape Transport Servicing Manual. The following information is provided for quick reference.

LK1 — J101/A ($\overline{\text{TO7T}}$)
LK2 — J101/A ($\overline{\text{TISEL1}}$)
LK3 — J101/1 ($\overline{\text{TILOL}}$)
LK4 — J101/1 (0V)
LK5 — +5V from formatter to power terminator, via SK1
LK6 — Internal terminator power
LK7 — J101/S ($\overline{\text{+5V}}$)
LK8 — J101/15 ($\overline{\text{TIWARS}}$)
LK9 — J101/18 ($\overline{\text{TISEL2}}$)
LK10 — J101/18 ($\overline{\text{0V}}$)
LK11 — J101/V ($\overline{\text{TISEL3}}$)
LK12 — J101/V ($\overline{\text{TIFS}}$)
LK13 } Omit to force Remote Selection only
LK14 }
LK15 — J101/1 ($\overline{\text{TILOL}}$)
LK16 — Internal function

For full industry compatibility the following links are fitted:

LK2, LK3 (option), LK6, LK8, LK9 and LK11.

For SE 8000 compatibility the following links are fitted:

LK1, LK4, LK6, LK10 and LK11.

4.4 MICRO-DIAGNOSTICS CONTROLS AND INDICATORS

4.4.1 General

Fig. 4.3 shows the Micro-diagnostics control panel, the function of each control/display is outlined in the following paragraphs.

NOTE: For complete details of the Micro-diagnostics system refer to CM.1030 (EMI 8800 Micro-diagnostics Manual).

4.4.2 Micro-diagnostics ON/OFF Switch

With the Micro-diagnostics ON/OFF switch set to ON, a red indicator (DIAG) on the transport control panel is illuminated (Section 4.2).

4.4.3 Displays

At switch on, the two-digit numeric display indicates '90' and the RUN, PASS and FAIL l.e.d. are extinguished. At this time ON LINE is inhibited, whilst the remaining transport control panel functions continue to operate normally. The maintenance Test FWD/OFF/Test REV Switch (Section 4.3.1) is also inhibited.

To set the required diagnostic program number (for further details refer to CM.1030 — EMI 8800 Micro-diagnostics Manual), the set 10's and set 1's switches, located under the numeric display, are pressed. Each switch increments the digits from 0 to 9, enabling a setting of 0 to 99 to be selected.

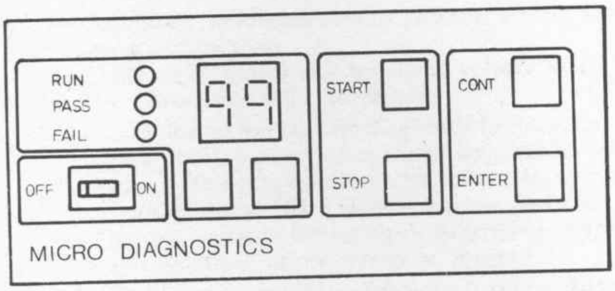


FIG. 4.3 MICRO-DIAGNOSTICS CONTROL PANEL

When the required program has been set, the START button is pressed; this causes the selected program to be run and the RUN l.e.d. indicator to be illuminated.

If a program is successfully completed, the PASS indicator is illuminated and further programs can be selected.

If a failure mode occurs, and the FAIL indicator is illuminated, an appropriate error code relative to a program listing is displayed. This error code is displayed for 3s followed by the current program number which is displayed for 1s. This sequence repeats until STOP is pressed. The FAIL l.e.d. is extinguished during the shorter (current program number displayed) time period.

4.4.4 Enter Facility

A number of diagnostic programs can be run seqentially by the use of the ENTER push button.

The first program to be run is set on the numeric display and ENTER is pressed. This causes the desired program to be entered on a 'program stack'. The numeric display then indicates that the desired program has been entered by displaying '99' (this is also the program number to run the 'program stack'). The next desired program to be run is then similarly entered.

When all the programs required have been entered, then with '99' on the numeric display START is pressed, causing the 'program stack' to commence.

The 'program stack' is retained until one of the following occurs:

(a) Program 98 is run (this program is designed to clear the 'program stack'.

(b) The Micro-diagnostics ON/OFF switch is set to OFF.

(c) Programs 90 or 91 are run. These are fixed stack program sequences which erase the program stack and substitute a fixed program set. The last program of both fixed stack programs is program 98 so that at the completion of programs 90 or 91 the program stack is left clear.

If (a), (b) or (c) do not occur the 'program stack' can be run as often as necessary (by running program 99), or added to by setting the numeric display to the program(s) required and pressing ENTER.

If program 99 is itself entered on the end of a 'program stack' a 'loop' condition will exist (for further details refer to CM.1030 — EMI 8800 Micro-diagnostics Manual).

4.4.5 Operator Interventions and CONT Switch

Some of the diagnostic programs require operator action. When this is necessary a unique 'operator action' number will be displayed and the RUN indicator will flash to attract the operator's attention. The operator is then required to consult the 'operator action' number in EMI 8800 Micro-diagnostics Manual (CM.1030), perform the required action and then press the CONT (continue) switch; this allows further program actions, if necessary. In some cases the CONT switch has to be pressed before the required actions are carried out.

The CONT switch can also be used in the event of a failure being reached in a 'program stack'. If the operator requires to continue with the program, the STOP switch is pressed to remove the program from the FAIL mode. The CONT switch is then pressed to enable the program to continue thereby allowing the next and subsequent tests to be run.

4.4.6 Return to Normal Operation

The diagnostics mode can be left at any time by pressing the STOP switch if a program is being run and setting the Micro-diagnostics ON/OFF switch to OFF. This action returns the microprocessor control to the normal system programs.

5. TAPE TRANSPORT DESCRIPTION

5.1. INTRODUCTION

The modular-constructed, microprocessor-controlled EMI 8800 tape transport is available in several versions, each with a range of options.

Dual recording (9-track NRZ/PE) or single (9-track PE, 9-track NRZ or 7-track NRZ) modes can be achieved.

The microprocessor controls all the sequencing procedures and most of the digital functions within the transport system, and is also used to provide a built-in diagnostic capability.

5.2 STANDARD TRANSPORT CONFIGURATION

The standard EMI 8800 transport configuration incorporates the following features:

(a) Direct drive motors which drive the tape reels without the use of belts or pulleys.

(b) An arm drive mechanism which simplifies tape loading. The mechanism utilises a crank and push-rod for durability and high reliability.

(c) The following range of automatic self-test routines are performed at switch on:

  (i) Connector validation checks (internal and/or external connectors).

  (ii) Check of all power and regulated voltage rails.

  (iii) Microprocessor self-test routine.

(d) In addition to the built-in diagnostic facilities described in (c), a Micro-diagnostics unit, which includes memory extension and other electronic circuits to provided a large range of diagnostic programs capable of testing or exercising all the major functions of the transport, is fitted.

(e) Maintenance switches and indicators are provided to enable all transport parameters to be set without the use of special test equipment.

(f) A strobe disc with built-in l.e.d. illumination, is fitted to the capstan. This enables the forward synchronous speed to be checked or adjusted in conjunction with the maintenance switches.
A remote load and on-line input is available, as is a choice of either remote unload and off-line or remote off-line input commands.

(h) For tape transports with dual recording modes, remote and/or front panel selection is feasible, with a choice of two program interlocks.

(j) Input commands for the Fast Search mode are available at the inputs.

5.3 ALTERNATIVE TRANSPORT CONFIGURATIONS

The following alternative configurations are available in any combination:

(a) Indirect-drive motors using toothed-belts and pulleys. This is the only version to which optional parking brakes (refer to Section 8.2.7) can be attached.

(b) No arm drive mechanism.

(c) No Micro-diagnostics unit.

(d) Refer to Section 8 for details of optional packages.

5.4 MECHANICAL DESCRIPTION

5.4.1 General (Fig. 5.1 to 5.5 inc.)

The EMI 8800 digital tape transport is constructed around an aluminium alloy deck casting, which is machined on the rear surface to accommodate the modular sub-assemblies and other mechanical components of the tape transport. The deck is hinged at the right-hand side to enable access to the rear when the transport is rack-mounted.

Access to the tape path area is by way of a transport dust-proof door which also hinges open at the right hand side. Behind the tape area, the casting is covered by a fascia panel which can be removed for servicing.

The transport controls are located at the right-hand side of the transport and the Micro-diagnostic controls, if fitted, are positioned behind a sliding door fitted to the fascia panel. Two maintenance switches are located on the Servo board at the rear of the casting.

All tape path components are mounted on the machined reference surface at the rear of the casting. The reel hub has an easy action, giving positive reel location and lock without adjustment; whilst the lower take-up spool has finger holes to assist in tape loading. Two-piece push-on, pull-off head covers fit over the head plate area, and act as a guide to the tape during lacing.

With arm drive fitted, the tension arms are driven below concealed bridges which mount fixed rollers; this simplifies the tape lacing procedure.

To gain access to the rear of the transport when mounted in an equipment rack, it is necessary to release the deck latch, thereby enabling the transport to be swung out from the rack to a maximum of 105 deg.

With the transport hinged open, access may be obtained to most of the following sub-assemblies and printed circuit boards.

(a) Power unit.
(b) Arm housing assembly (with or without arm drive).
(c) Capstan motor.
(d) Reel motors.
(e) Front panel assembly.
(f) Servo board.
(g) Servo heat sink.
(h) Head plate assembly.
(j) Write Data board.
(k) Read Data board.
(l) Micro-diagnostics unit (if fitted).

The modular construction simplifies the removal and replacement of any of the above items. The servo heat sink hinges to permit access to the rear of the Servo board. The Write Data board is hinged for full access to the Read Data board. The boards are interconnected by plugs and sockets, the Servo and Read Data boards each being retained by two quick-release fasteners, so that no tools are required to facilitate their removal.

5.4.2 Power Unit

The Power unit comprises of a transformer, rectifiers and reservoir capacitors, mounted on a box-like chassis, together with a regulator heatsink and a d.c. fuse/distribution printed circuit board. The supply fuse, input socket and voltage regulator, are easily accessible. The regulator heat sink (+5V) and three regulators (-5V, +12V, -12V) can each be replaced without removing the power unit from the transport.

When fitting the power unit to the transport casting, the unit is located on two dowel pins which provide support until five M5 screws are inserted and tightened. An earth strap connects chassis earth to the casting.

5.4.3 Front Panel Assembly

The front panel assembly comprises of a printed circuit board with push-button switches and l.e.d. indicators mounted on a sub-panel positioned immediately behind the fascia panel. The power switch and neon indicator are located at the lower end of the front panel fascia, and fit through clearance holes in the sub-panel. Access to the sub-panel is achieved by removal of the two front panel fascia retaining screws.

5.4.4 Servo Electronics

The Servo board (30 cm × 22 cm) is located to the left of the casting when viewed from the rear. Access to the rear of the Servo board is possible when the heat sink is hinged open. When all the plugs and sockets have been disconnected from the Servo board, it may be removed by releasing two quick-release fasteners and withdrawing the board from the two locating dowel pins at the casting end.

5.4.5 Servo Heat Sink Assembly

The servo heat sink assembly is positioned to the left of the Servo board and is hinged for easy access to the heat sink transistors and to the rear of the Servo board itself.

To hinge open: raise the heat sink against the pivot springs so that the bracket holes clear the locating pins, and swing open.

5.4.6 Write Data Board

The Write Data board (20 cm × 22 cm) is mounted adjacent to the Read Data board at the rear of the transport casting and is hinged for easy access. The input interface connector is at the top of the board and the head connector below. Internal signals are routed via ribbon cable, from the Read Data board, at the hinged side of the board. With the connectors removed, the board can be disconnected from the transport by releasing the quick-release fastener and loosening two casting mounting screws of the upper hinge bracket. This will free the board from the hinge fixings.

5.4.7 Read Data Board

The Read Data board (30 cm × 22 cm) is mounted adjacent to the Write Data board. Complete access is achieved when the Write Date board is hinged open. With the connectors removed, the Read Data board can be released from the transport by releasing the two quick-release fasteners and removing the board in the same way as for the Servo board.

5.4.8 Micro-diagnostics Unit

The Micro-diagnostics unit is a self-contained unit located at the rear of the transport casting (top right-hand corner). The front panel controls are accessible, via the sliding panel, from the front of the transport (top left of fascia panel). The unit is clamped to the casting by two captive screws.

5.5 FUNCTIONAL DESCRIPTION

5.5.1 General

The EMI 8800 tape transport can be divided into the following functional areas; a block diagram is shown in Fig. 5.6.

(a) Microprocessor (transport control) circuits.
(b) Capstan, take-up and supply servo circuits.
(c) Data read and write electronics.
(d) Power supplies.

5.5.2 Microprocessor (Transport Control) Circuits

The transport control logic is implemented entirely by the microprocessor system, located on the Servo board. Command lines from the front panel (switches) and the interface are fed together with the transport status information to the microprocessor input ports. The microprocessor output ports control the servo ramp generator, transport status lines and interlocks.

5.5.3 Servo Circuits

In addition to the microprocessor with its associated input/output ports, RAM and ROM, the Servo board contains the capstan servo, reel servos and arm drive circuits, the load relay, output drivers and receivers, and power fail circuits.

NOTE: The capstan and reel servo output transistors together with the power switching circuits for the REWIND or FAST SEARCH functions are mounted on the adjacent servo heat sink.

The reel servo power supplies are switched electrically from ±14V to ±24V during the FAST SEARCH or REWIND functions. The capstan servo is a velocity-controlled servo system fed by a program-controlled ramp generator which covers the complete tape speed range 12.5 to 45 i.p.s. During the FAST SEARCH and REWIND sequences a gain change is made at the pre-amplifier so that the digital-to-analogue converter (DAC) output covers the tape speed range 0 to 250 i.p.s. However, when either reel servo attains maximum speed, the corresponding arm position alters to cause a reduction of REWIND speed. REWIND speed is therefore determined by the maximum rev/min of either reel servo, the exception being when both tape (supply and take-up) diameters are sufficiently large, the REWIND speed is then determined by the capstan servo.

5.5.4 Data Electronics

(a) Write Data Board

A single build of the Write Data board suffices for DUAL, NRZ only (including 7-track), or

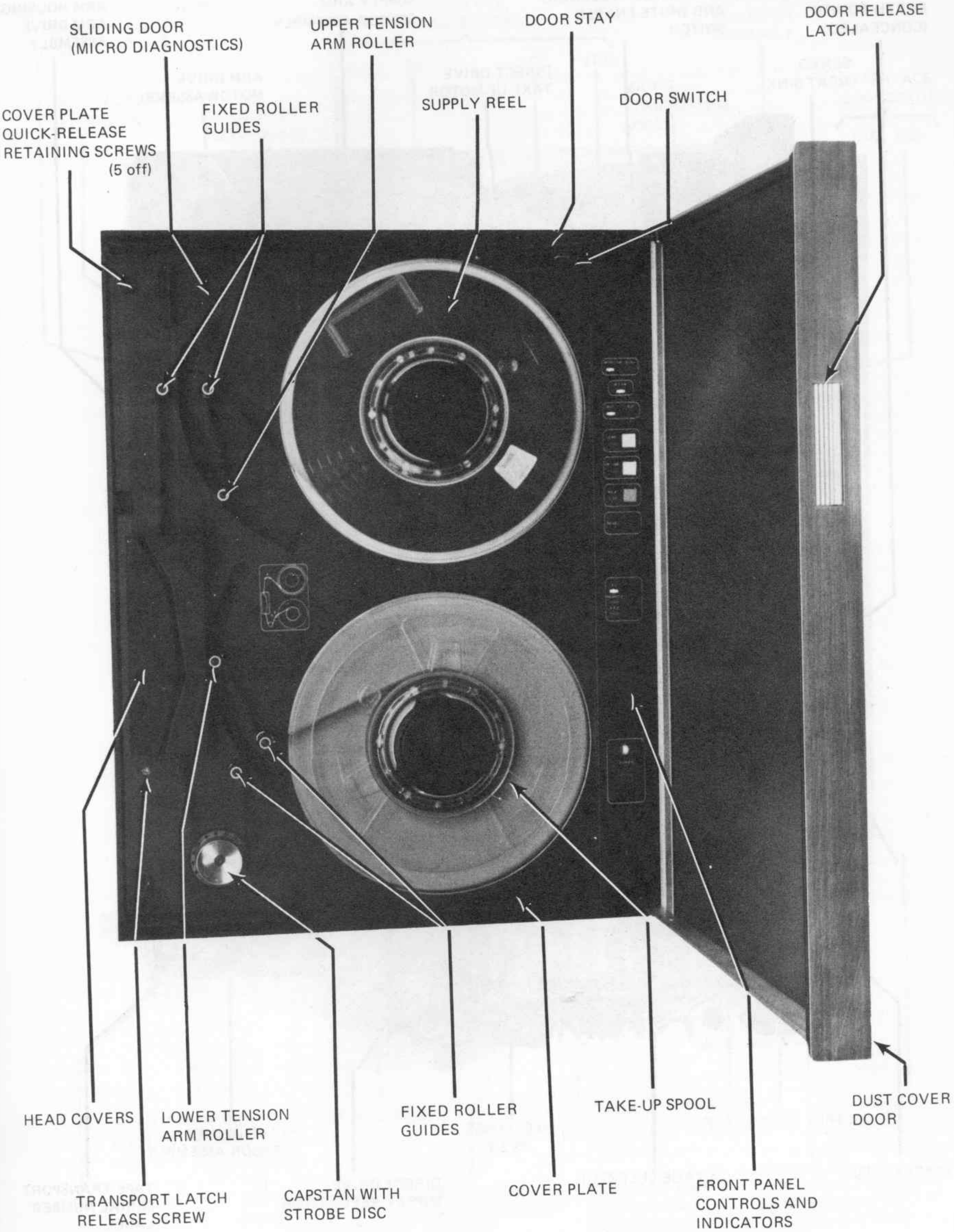


FIG. 5.1 EMI8800 TAPE TRANSPORT: GENERAL VIEW (DOOR OPEN)

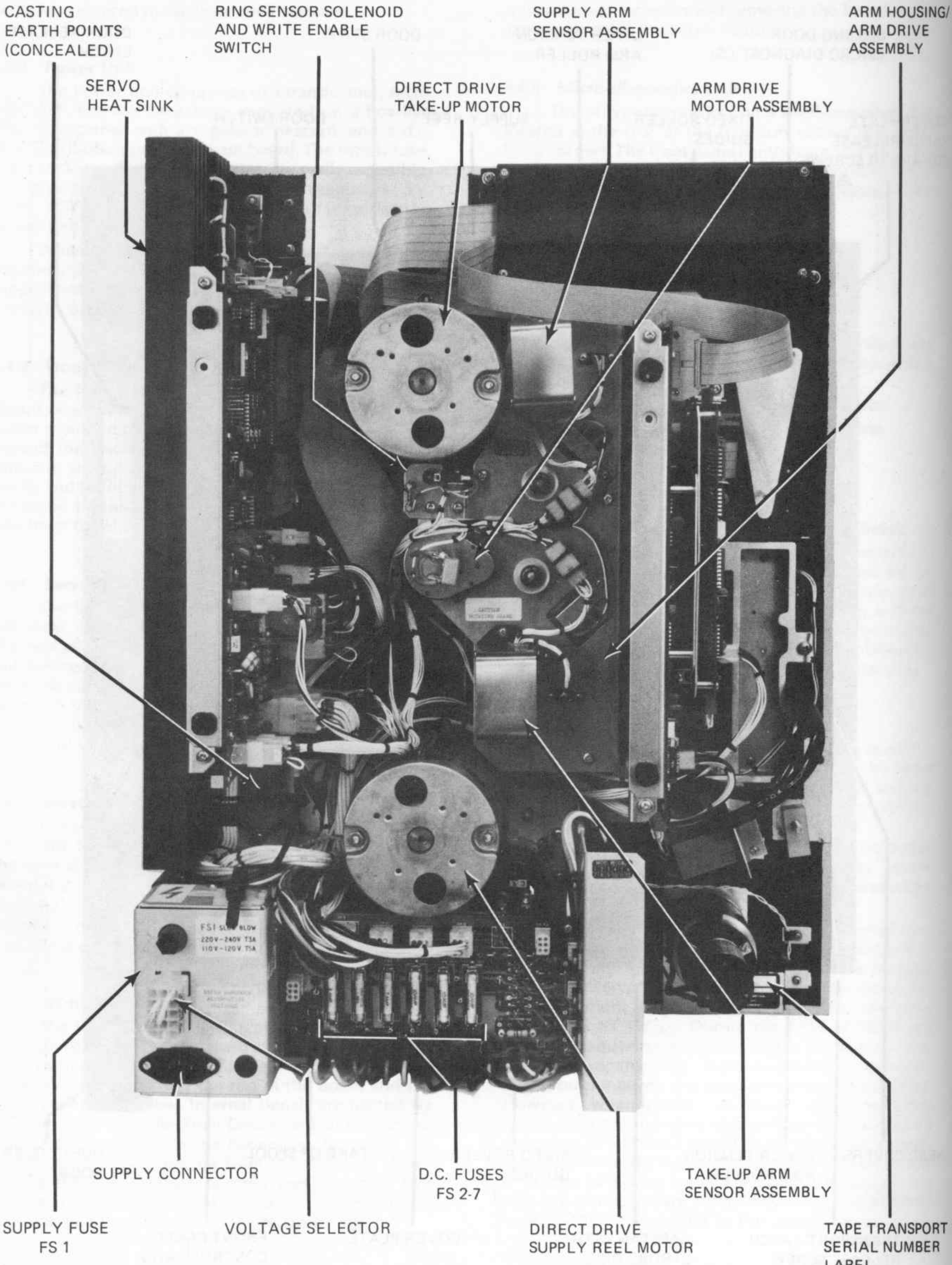

CASTING EARTH POINTS (CONCEALED)
RING SENSOR SOLENOID AND WRITE ENABLE SWITCH
SUPPLY ARM SENSOR ASSEMBLY
ARM HOUSING/ ARM DRIVE ASSEMBLY
SERVO HEAT SINK
DIRECT DRIVE TAKE-UP MOTOR
ARM DRIVE MOTOR ASSEMBLY
FS1 SLOW BLOW
220V–240V T3A
110V–120V T5A
SUPPLY CONNECTOR
D.C. FUSES FS 2-7
TAKE-UP ARM SENSOR ASSEMBLY
SUPPLY FUSE FS 1
VOLTAGE SELECTOR
DIRECT DRIVE SUPPLY REEL MOTOR
TAPE TRANSPORT SERIAL NUMBER LABEL

FIG. 5.2 EMI 8800 TAPE TRANSPORT: REAR VIEW

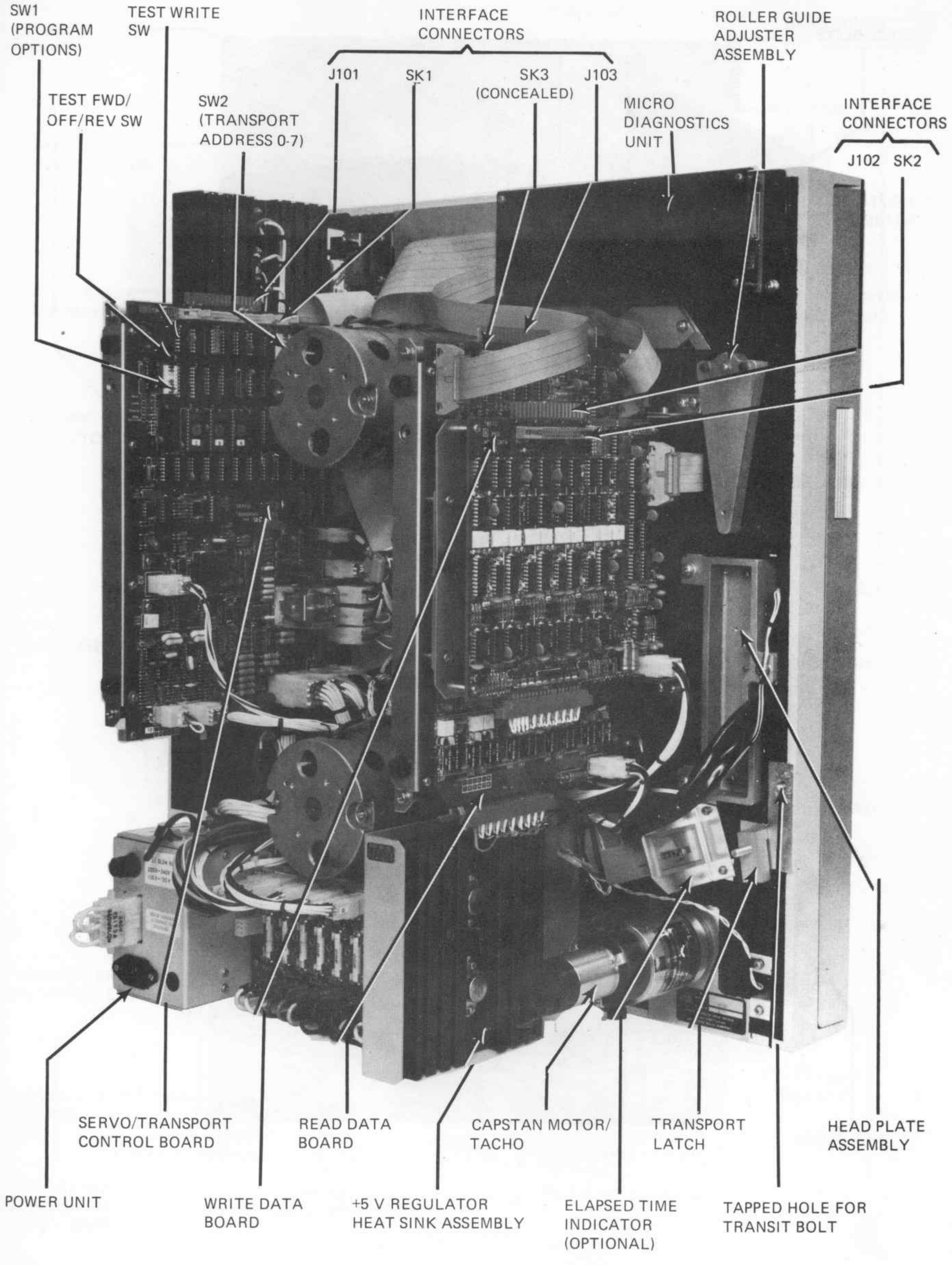


FIG. 5.3 EMI 8800 TAPE TRANSPORT: REAR VIEW (LEFT)

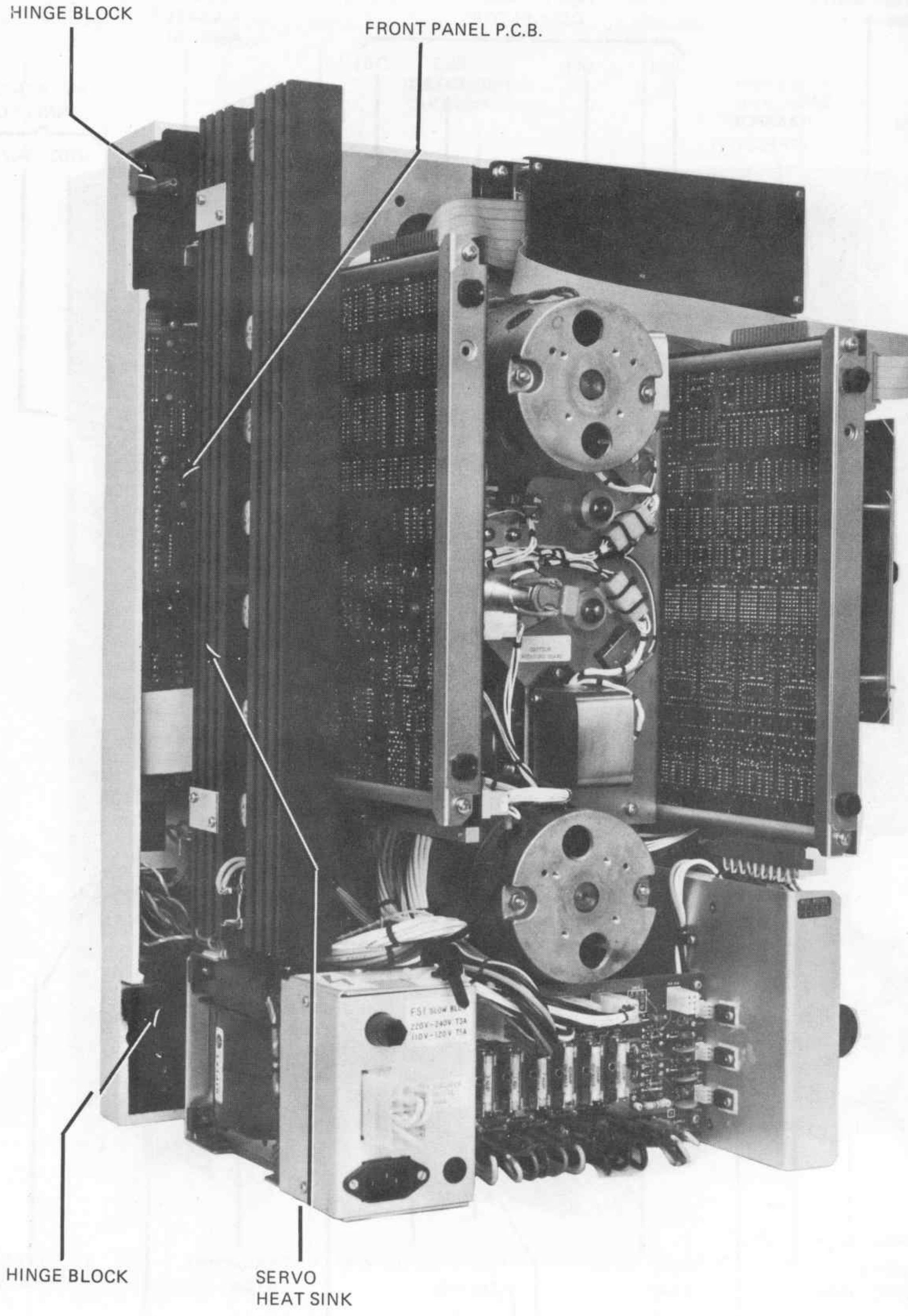


FIG. 5.4 EMI 8800 TAPE TRANSPORT: REAR VIEW (RIGHT)

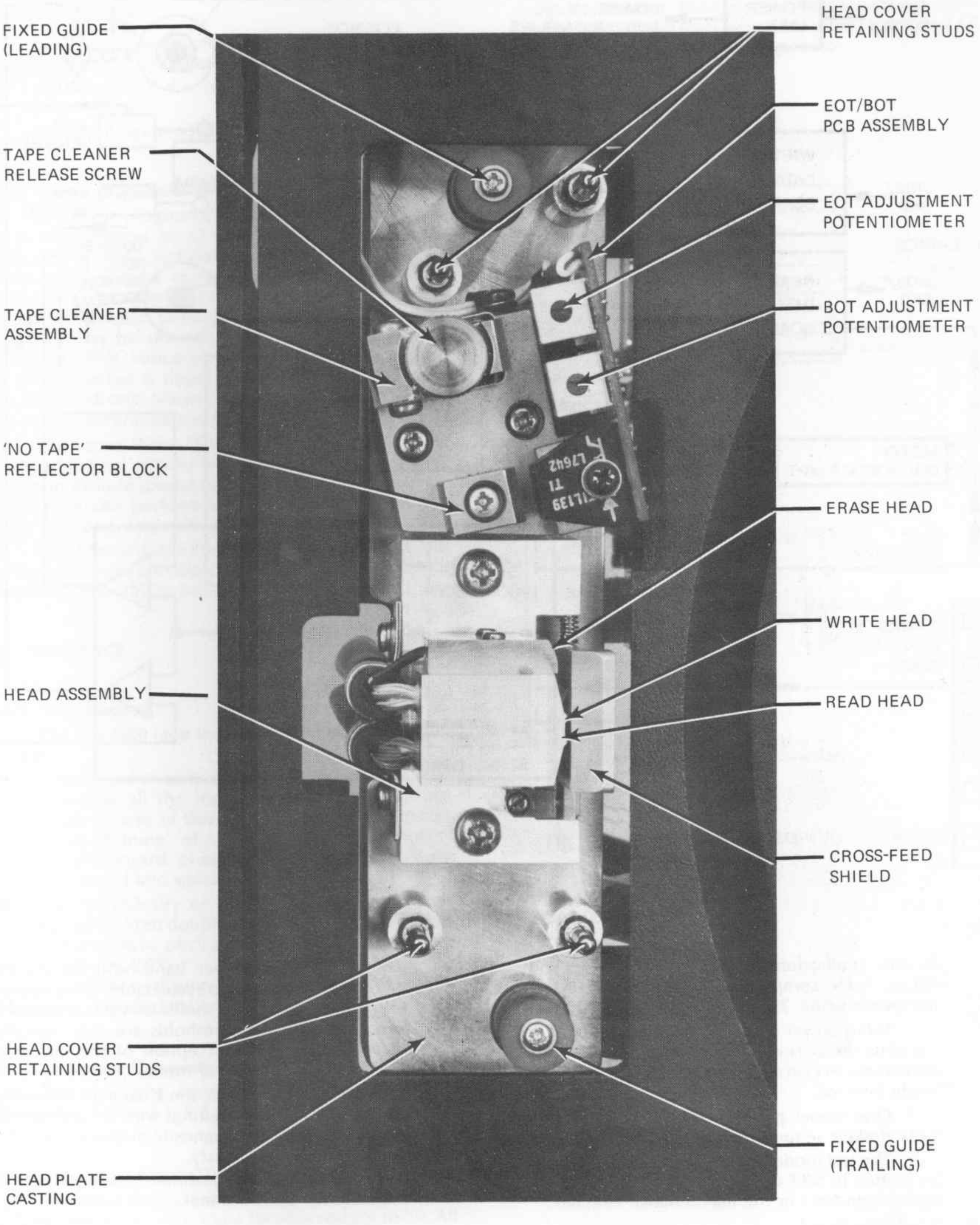


FIG. 5.5 EMI 8800 TAPE TRANSPORT: HEAD COMPONENTS

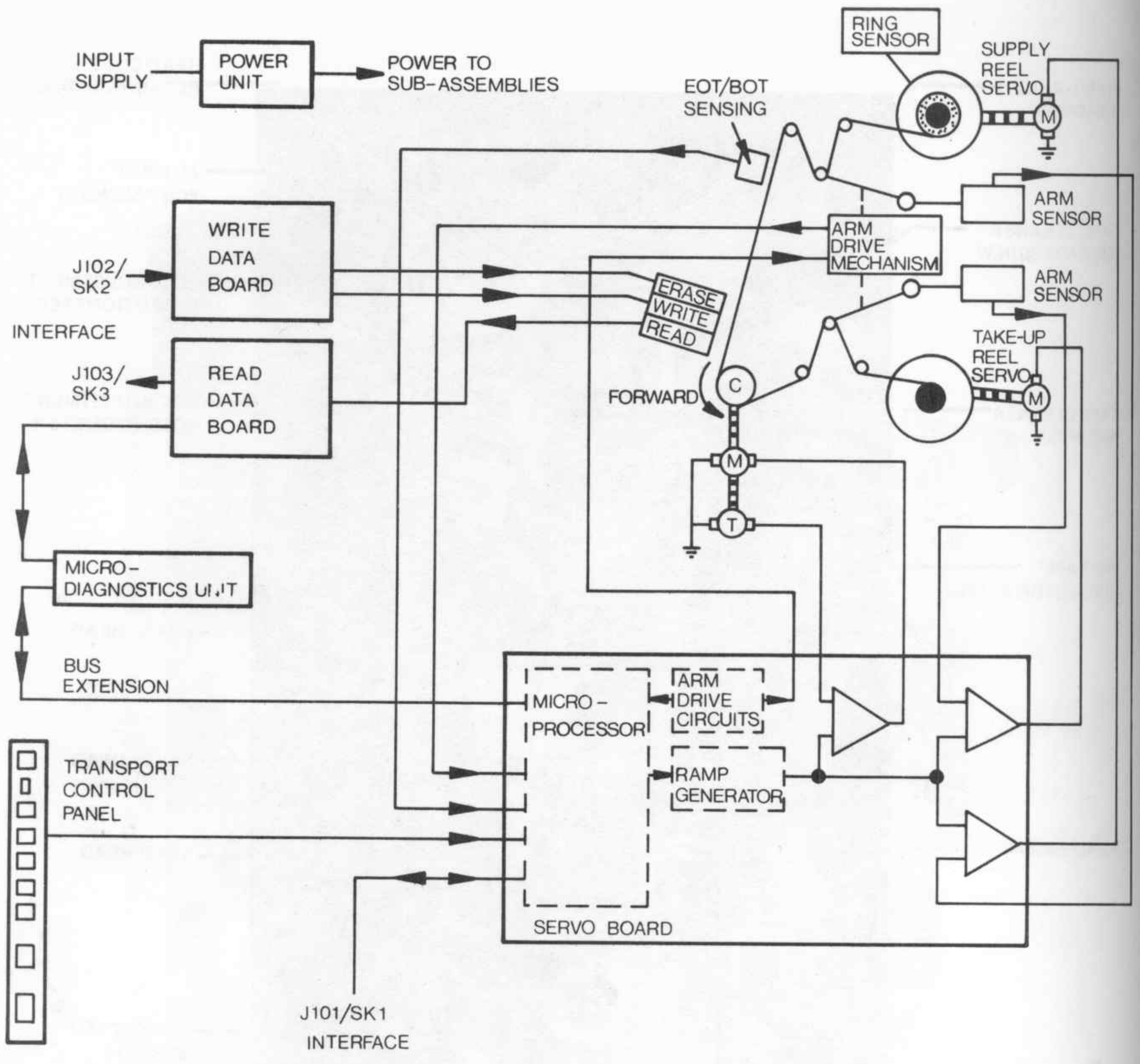


FIG. 5.6 EMI 8800 TAPE TRANSPORT: BLOCK DIAGRAM

PE only applications at tape speeds 25, 37.5 and 45 i.p.s. Some component changes are necessary for speeds below 25 i.p.s.

Write power from the ring sensor supplies the write driver circuits which feed the appropriate current level in accordance with the NRZ or PE mode selected.

One preset potentiometer is used for the write deskew setting when in the NRZ mode.

The test mode circuits enable 'all 1's' data to be written in NRZ or PE, controlled by either the microdiagnostics or the maintenance switches.

(b) Read Data Board

The Read Data board has a different build for each tape speed and for DUAL or SINGLE, NRZ or PE as appropriate. Each speed build has links which cause the Servo board microprocessor to select the correct speed and ramp settings. If the Read Data board is disconnected the servos will automatically operate at 45 i.p.s.

The read pre-amplifiers have switched gains which provide a higher bandwidth for the PE mode. Ten thresholds are selectable; three operational and two test thresholds for each of the NRZ and PE modes. All thresholds are automatically controlled, with the exception of the low read threshold which is a user input.

In the NRZ mode, the Character Assembly Time (CAT) has three settings with the addition of a special setting for diagnostic purposes. No CAT adjustments are necessary.

A single gain adjustment potentiometer is provided for each channel.

5.5.5 Power Unit

The Power unit incorporates four separate monolithic regulators each with fold down current limit and thermal shutdown protection. In addition, the +5V regulator has a separate crowbar device. Full power fail detection circuitry is contained on the Servo board and all power interconnection sockets have connector validation (CV) pins.

The outputs provided by the power unit are:

(a) ±24V d.c. and ±14V d.c. unregulated for the transport servos.

(b) +24V pk full wave rectified, unsmoothed for the arm drive circuit, load relay and indicator supply.

(c) ±12V and ±5V d.c. regulated and protected circuit supplies.

All the unregulated supplies are d.c. fused.

5.5.6 Micro-diagnostics Unit

The Micro-diagnostics unit is mounted complete on its own control panel behind the transport cover plate sliding door. Sufficient memory extension is included to provide a comprehensive range of special programs each capable of diagnosing faults or of exercising the transport through routines or 'Scope loops'. Programs may be selected singly or in groups and a RUN/PASS/FAIL indication is given. If a failure occurs, an error number is displayed which, by reference to CM.1030 (EMI 8800 Micro-diagnostics Manual) enables the user to determine the faulty area.

The Servo, Write Data and Read Data boards include additional circuits which enable the diagnostics system to include special high/low tolerance programs. These programs perform a double check on gain settings, tape path and write deskew procedures.

The Micro-diagnostics Unit is connected to the Servo board (microprocessor circuits) and the Read Data board, via two ribbon cables.

5.6 INTERFACE

5.6.1 Introduction

The EMI 8800 tape transport interface is designed so that;

(a) When used in conjunction with an EMI 8830 dual formatter all the input/output connections are made by way of three ribbon cables. This makes 'daisy-chaining' of up to eight tape transports straightforward, as each transport can be directly connected into special ribbon cables.

(b) For full industry or SE 8000 tape transport compatibility three double-sided 18-pin edge connectors at 0.156 in. pitch are provided on the transport (J101, J102, J103).

Fig. 5.7 shows the interfacing connectors for the alternative methods detailed.

5.6.2 Interface Connections

The interface connector pin assignments are detailed in Tables 5.1, 5.2 and 5.3.

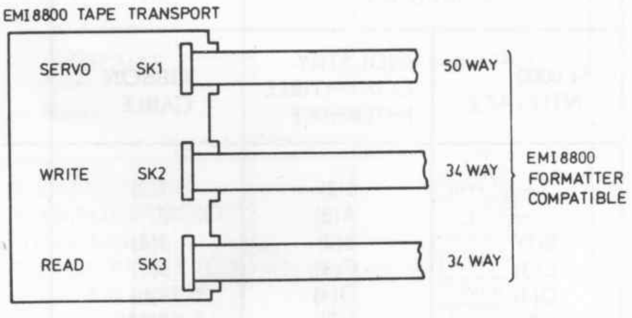
5.6.3 Transport Input (TI) Signals

All tape transport input lines are terminated with a 220 ohm resistor to +5V and a 330 ohm resistor to 0V. All inputs must be TTL compatible low-true signals, whereby a logic '1' is represented by the TTL low level and must lie in the range of 0V to +0.4V.

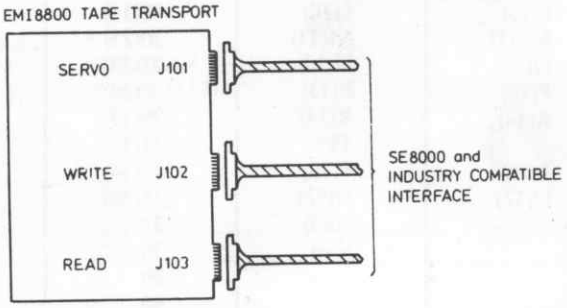
Table 5.4 lists all the input signal lines, together with their mnemonic and function.

5.6.4 Transport Output (TO) Signals

All tape transport output lines are TTL compatible and a logic '1' or true state is represented by the TTL low level, which lies in the range of 0V to +0.4V at the input/output connector. The logic '0' or false state is represented by the TTL high level, which lies in the range of +2.4V to +5V at the input/output connector.



(a) RIBBON CABLE INTERFACE



(b) DUAL 18 WAY 0·156" PITCH INTERFACE FOR INDUSTRY COMPATIBLE EDGE CONNECTORS

FIG. 5.7 EMI 8800 TAPE TRANSPORT INTERFACING

TABLE 5.1
SERVO BOARD INTERFACE CONNECTIONS

SK101 (J101)		SK1	SIGNAL	MNEMONIC
SE8000 INTERFACE	INDUSTRY-COMPATIBLE INTERFACE	RIBBON CABLE		
—	1(2)	1(2)	LOAD ON LINE	$\overline{\text{TILOL}}$
—	A(8)	2	SELECT 1	$\overline{\text{TISEL 1}}$
B(2)	B(2)	3(4)	SET OVERWRITE	$\overline{\text{TIOVW}}$
C(3)	C(3)	5(6)	FORWARD	$\overline{\text{TIFWD}}$
D(4)	D(4)	7(8)	SELECT HIGH DENSITY	$\overline{\text{TIHIDEN}}$
E(5)	E(5)	9(10)	REVERSE	$\overline{\text{TIREV}}$
F(6)	F(6)	11(12)	HIGH DENSITY	$\overline{\text{TOHIDEN}}$
H(7)	H(7)	13(14)	REWIND	$\overline{\text{TIREW}}$
J(8)	J(8)	15	SELECT 0	$\overline{\text{TISEL 0}}$
K(9)	K(9)	16(17)	SET WRITE STATUS	$\overline{\text{TISWS}}$
L(10)	L(10)	18(19)	REWIND UNLOAD/OFF LINE	$\overline{\text{TIRWU/OFL}}$
M(11)	M(11)	20(21)	ON LINE	$\overline{\text{TOONL}}$
N(12)	N(12)	22(23)	REWINDING	$\overline{\text{TORWDG}}$
P(13)	P(13)	27(28)	FILE PROTECTED	$\overline{\text{TOFPTD}}$
R(14)	R(14)	29(30)	LOAD POINT	$\overline{\text{TOLDPT}}$
	15*	31(32)	WRITE AMPLIFIER RESET	$\overline{\text{TIWARS}}$
T(16)	T(16)	33(34)	READY	$\overline{\text{TORDY}}$
U(17)	U(17)	35(36)	END OF TAPE	$\overline{\text{TOEOT}}$
	18(8)	37	SELECT 2	$\overline{\text{TISEL 2}}$
	V(8)	38	SELECT 3	$\overline{\text{TISEL 3}}$
		39	SELECT 4	$\overline{\text{TISEL 4}}$
		40	SELECT 5	$\overline{\text{TISEL 5}}$
		41	SELECT 6	$\overline{\text{TISEL 6}}$
		42	SELECT 7	$\overline{\text{TISEL 7}}$
V(18)		43(44)	FAST SEARCH	$\overline{\text{TIFS}}$
S		25, 26	TERMINATOR POWER (+5V)	
		45	SPEED SETTING	$\overline{\text{TOSS 1}}$
		46	SPEED SETTING	$\overline{\text{TOSS 0}}$
		47	SPEED SETTING	$\overline{\text{TOSS 2}}$
		49, 50	CONNECTOR VALIDATION	
A(1)			7-TRACK	$\overline{\text{TO7T}}$

NOTES: (1) *The ground pin (0V) associated with each signal pin is shown in brackets.*

(2) ** allocated on Pertec formatter.*

TABLE 5.2
WRITE DATA BOARD INTERFACE CONNECTIONS

SK102 (J102)		SK2	SIGNAL	MNEMONIC
SE8000 INTERFACE	INDUSTRY COMPATIBLE INTERFACE	RIBBON CABLE		
A(1)	A(1)	1(2)	WRITE DATA STROBE	$\overline{\mathrm{TIWDS}}$
C(3)	C(3)	5(6)	WRITE AMPLIFIER RESET	$\overline{\mathrm{TIWARS}}$
	F(6)	9(10)	LOW THRESHOLD	$\overline{\mathrm{TILOTHR}}$
L(10)	L(10)	15(16)	WRITE DATA PARITY (C)*	$\overline{\mathrm{TIWDP}}$
M(11)	M(11)	19(20)	WRITE DATA 0 (omit)*	$\overline{\mathrm{TIWD0}}$
N(12)	N(12)	21(22)	WRITE DATA 1 (omit)*	$\overline{\mathrm{TIWD1}}$
P(13)	P(13)	23(24)	WRITE DATA 2 (B)*	$\overline{\mathrm{TIWD2}}$
R(14)	R(14)	25(26)	WRITE DATA 3 (A)*	$\overline{\mathrm{TIWD3}}$
S(15)	S(15)	27(28)	WRITE DATA 4 (8)*	$\overline{\mathrm{TIWD4}}$
T(16)	T(16)	29(30)	WRITE DATA 5 (4)*	$\overline{\mathrm{TIWD5}}$
U(17)	U(17)	31(32)	WRITE DATA 6 (2)*	$\overline{\mathrm{TIWD6}}$
V(18)	V(18)	33(34)	WRITE DATA 7 (1)*	$\overline{\mathrm{TIWD7}}$
		17,18	TERMINATOR POWER (+5V)	
		13,14	CONNECTOR VALIDATION	

NOTES: *(1) The ground pin (0V) associated with each signal is shown in brackets.*
*(2) * denotes 7-track designations.*

TABLE 5.3
READ DATA BOARD INTERFACE CONNECTIONS

SK103 (J103)		SK3	SIGNAL	MNEMONIC
SE8000 INTERFACE	INDUSTRY COMPATIBLE INTERFACE	RIBBON CABLE		
1(A)	1(A)	1(2)	READ DATA PARITY (P)*	$\overline{\mathrm{TORDP}}$
2(B)	2(B)	3(4)	READ DATA STROBE	$\overline{\mathrm{TORDS}}$
3(C)	3(C)	5(6)	READ DATA 0 (omit)*	$\overline{\mathrm{TORD0}}$
4(D)	4(D)	7(8)	READ DATA 1 (omit)*	$\overline{\mathrm{TORD1}}$
8(J)	8(J)	11(12)	READ DATA 2 (B)*	$\overline{\mathrm{TORD2}}$
9(K)	9(K)	13(14)	READ DATA 3 (A)*	$\overline{\mathrm{TORD3}}$
10(L)	10(L)	15(16)	NON RETURN TO ZERO	$\overline{\mathrm{TONRZ}}$
	11(M)	19(20)	7-TRACK	$\overline{\mathrm{TO7T}}$
13(P)	13(P)	23(24)	LOW SPEED	$\overline{\mathrm{TOLOSPD}}$
14(R)	14(R)	25(26)	READ DATA 4 (8)*	$\overline{\mathrm{TORD4}}$
15(S)	15(S)	27(28)	READ DATA 5 (4)*	$\overline{\mathrm{TORD5}}$
17(U)	17(U)	31(32)	READ DATA 6 (2)*	$\overline{\mathrm{TORD6}}$
18(V)	18(V)	33(34)	READ DATA 7 (1)*	$\overline{\mathrm{TORD7}}$
6(F)		9(10)	LOW THRESHOLD	$\overline{\mathrm{TOLOTHR}}$
		29,30	CONNECTOR VALIDATION	

NOTES: *(1) The ground pin (0V) associated with each signal is shown in brackets.*
*(2) * denotes 7-track designations.*

TABLE 5.4
TRANSPORT INPUT (TI) SIGNAL FUNCTIONS

SIGNAL AND MNEMONIC	FUNCTION
TRANSPORT SELECT (TISEL0 to TISEL7 inc)	These are the transport select lines; in a multiple transport system they control which transport accepts formatter commands. Unless SELECTED and ON-LINE, all inputs and outputs from a transport are inhibited.
FORWARD (TIFWD)	When TIFWD is true, tape is accelerated in the forward direction to synchronous or fast search speed and then maintained at that speed. The tape control is such that the tape is accelerated or decelerated to or from synchronous speed within 0.19 in. ± 0.02 in.
REVERSE (TIREV)	When TIREV is true, tape is accelerated in the reverse direction to synchronous or fast search speed and then maintained at that speed. *NOTE: TIFWD and TIREV commands should not be applied simultaneously.*
REWIND (TIREW)	The TIREW pulse initiates a rewind sequence to return the tape to load point. During the complete rewind sequence the transport output TORWDG (rewinding) is true and the TORDY (ready) output is false, these commands are used to inhibit further commands.
SET WRITE STATUS (TISWS)	The TISWS level is used to switch the write power on the transport. Write power cannot be achieved if the supply reel does not have a write enable ring fitted. This level must be true for a minimum period of 20 µs after the front edge of a TIFWD input when the write mode of operation is required. If the read mode is required, the TISWS line must be false for a minimum period of 20 µs after the front edge of a TIFWD or TIREV input.
SET OVERWRITE (TIOVW)	The TIOVW level is used to provide the edit facility to allow updating of a selected record. The tape must be stopped in the preceding Inter Record Gap (IRG) in such a position that the new record will be overwritten in precisely the same position as that occupied by the old record. When TIOVW is held true simultaneously with TISWS at the initiation of TIFWD the write power control circuit is conditioned into an EDIT mode. At the end of a new record, a TIWARS (write amplifier reset) command is given. This causes the write power to be ramped down so that no spurious character is written in the following IRG and no further records are erased.
OFF-LINE (TIOFL) WITH REWIND AND UNLOAD OPTION	The TIOFL pulse sets the transport OFF-LINE. In this condition it is under manual control only, and further communication with the formatter is inhibited. The transport can only be returned ON LINE by manual operation. An alternative feature is selectable by means of a dual-in-line switch on the Servo board, whereby the transport can automatically unload the tape on receipt of the TIOFL command.
FAST SEARCH (TIFS)	The TIFS is a command level used in conjunction with TIFWD or TIREV, and enables bi-directional fast searches (write disabled) of up to 120 i.p.s. At these speeds data integrity is lost, but records may be counted at the formatter as they are traversed. The EMI 8800 formatter is able to recognise file marks at high speed when operating in the PE mode, so that a file search system can be used. Following the application of TIFS together with TIFWD or TIREV, the tape is accelerated to normal synchronous speed where it continues for approximately 1 s. After this period the tape is further accelerated to an ultimate speed of 2.7 times the normal synchronous speed +10%. For a normal FAST SEARCH sequence the TIFS is switched false at a point determined by the formatter/controller, whilst TIFWD or TIREV is maintained. The tape is then decelerated to normal synchronous speed which continues until TIFWD or TIREV are switched false. The start/stop time of the additional ramps are 200 ms start and 100 ms stop. By removal of TIFS before a predetermined halt position, the nominal stop distance of 0.19 in. is preserved.
SELECT HIGH DENSITY (TIHIDEN)	For a 9-track dual NRZ/PE transport, the TIHIDEN signal is used to select PE mode when true, provided that remote operation has been

Table 5.4 cont'd

SIGNAL AND MNEMONIC	FUNCTION
	selected. The interface line is inoperative when local selection is made or if the transport has been constructed as PE only or NRZ only. For a 7-track NRZ transport, the $\overline{\text{TIHIDEN}}$ signal is used to select the operating density. This would normally be 800 b.p.i. when true and 556 b.p.i. when false.
LOAD ON LINE ($\overline{\text{TILOL}}$)	The $\overline{\text{TILOL}}$ input can be used to restore tape tension remotely and place the transport back ON-LINE when a power failure has been experienced during operation. Unless parking brakes are fitted, (refer Section 8) before a remote LOAD and ON-LINE operation is initiated the tension arms must be in their relaxed position, the tape must be in the path and on both reels and the power must have been returned for at least 1s.
WRITE DATA STROBE ($\overline{\text{TIWDS}}$)	The $\overline{\text{TIWDS}}$ pulse is used to clock data into the transport. Data inputs must be maintained constant during the $\overline{\text{TIWDS}}$ pulse.
WRITE DATA ($\overline{\text{TIWD0}}$ to $\overline{\text{TIWD7}}$ inc, $\overline{\text{TIWDP}}$)	The write data lines $\overline{\text{TIWD0}}$, $\overline{1}$, $\overline{2}$, $\overline{3}$, $\overline{4}$, $\overline{5}$, $\overline{6}$, $\overline{7}$, $\overline{\text{P}}$ carry the data to be written on the tape and are clocked into the transport by $\overline{\text{TIWDS}}$. For NRZ transports, normal data is transmitted via the data lines and NRZ1 data generation is performed automatically within the transport. Hence, a true level at a data input, clocked by $\overline{\text{TIWDS}}$, causes a change of flux on the corresponding head track. For PE transports, the polarity of the flux on a given head will correspond to the relevant polarity of the data input at the time of the $\overline{\text{TIWDS}}$ pulse. For PE operation at 1600 b.p.i., half bit periods are necessary (i.e. 3200 f.r.p.i. maximum) and consequently the frequency of the $\overline{\text{TIWDS}}$ pulse must correspond to 3200 f.r.p.i.
WRITE AMPLIFIER RESET ($\overline{\text{TIWARS}}$)	The $\overline{\text{TIWARS}}$ pulse is used on NRZ transports to generate the longitudinal redundancy check (LRC) character, such that the number of flux reversals (ones) along each track of the record is even (including the LRC character). In the set overwrite ($\overline{\text{TIOVW}}$) mode, the ($\overline{\text{TIWARS}}$) command not only writes the LRC character, but initiates turn-off of the write power. Although PE transports have no LRC the $\overline{\text{TIWARS}}$ command may still be used for the $\overline{\text{TIOVW}}$ mode.
LOW THRESHOLD ($\overline{\text{TILOTHR}}$)	The $\overline{\text{TILOTHR}}$ signal may be used to enable data to be retrieved from low output or marginal tapes. When held true, the read electronics operates with a low read threshold. In addition, on NRZ transports, the CAT is increased slightly to overcome marginal skew problems. If a 'read only' transport is required then provision is made on the SE 8000 compatible interface lines and on the SE 8000 interface ribbon cables to enable the low threshold facility to be used.

TABLE 5.5

TRANSPORT OUTPUT (TO) SIGNAL FUNCTIONS

NOTE: All outputs enabled only if the Transport is SELECTED and ON LINE.

SIGNAL AND MNEMONIC	FUNCTION
READY ($\overline{\text{TORDY}}$)	The $\overline{\text{TORDY}}$ output is true when the transport is ON LINE, SELECTED and NOT REWINDING.
ON-LINE ($\overline{\text{TOONL}}$)	When the $\overline{\text{TOONL}}$ output is true, the transport is under remote control and all manual controls except POWER and RESET are disabled.
REWINDING ($\overline{\text{TORWDG}}$)	The $\overline{\text{TORWDG}}$ level is true during a complete rewind sequence. It reverts to false when load point is reached following the forward run to BOT. During the rewind sequence, the transport indicates not ready by making the $\overline{\text{TORDY}}$ line false.

Table 5.5 cont'd

<table>
<tr><th>SIGNAL AND MNEMONIC</th><th>FUNCTION</th></tr>
<tr><td>FILE PROTECT
($\overline{\text{TOFPTD}}$)</td><td>The $\overline{\text{TOFPTD}}$ level indicates that the 'write enable' ring is not fitted in the supply reel and that all write functions are inhibited.</td></tr>
<tr><td>LOAD POINT
($\overline{\text{TOLDPT}}$)</td><td>The $\overline{\text{TOLDPT}}$ output is true when the BOT tab is opposite the photosensor and the transport is ready ($\overline{\text{RDY}}$). When this level is true the reverse ($\overline{\text{REV}}$) command is inhibited.</td></tr>
<tr><td>END OF TAPE
($\overline{\text{TOEOT}}$)</td><td>The $\overline{\text{TOEOT}}$ output is true when the EOT tab is opposite the photosensor.</td></tr>
<tr><td>NRZ/PE STATUS
($\overline{\text{TONRZ}}$)</td><td>This level reports the chosen format of the selected transport; true for NRZ and false for PE.</td></tr>
<tr><td>HIGH DENSITY
($\overline{\text{TOHIDEN}}$)</td><td>The $\overline{\text{TOHIDEN}}$ signal is true to indicate PE operation for a 9 track dual transport. The signal is also true when the transport has been constructed for use in PE or NRZ modes only. For a 7 track NRZ transport, the $\overline{\text{TOHIDEN}}$ signal is used to indicate the operating density. This would normally be 800 bpi (true) and 556 bpi (false).</td></tr>
<tr><td>7 TRACK
($\overline{\text{TO7T}}$)</td><td>When the $\overline{\text{TO7T}}$ line is true it indicates that a 7-track transport has been selected.</td></tr>
<tr><td>READ DATA
($\overline{\text{TORD0}}$ to $\overline{\text{TORD7}}$ inc, $\overline{\text{TORDP}}$)</td><td>The $\overline{\text{TORD0}}$, $\overline{1}$, $\overline{2}$, $\overline{3}$, $\overline{4}$, $\overline{5}$, $\overline{6}$, $\overline{7}$, $\overline{\text{P}}$, lines transmit the information from the read amplifier. For PE transports the data is transmitted in its encoded form; for NRZ transports it is clocked into the formatter by the $\overline{\text{TORDS}}$ pulse.</td></tr>
<tr><td>SET SPEED SETTING
($\overline{\text{TOSS0}}$, $\overline{\text{TOSS1}}$, $\overline{\text{TOSS2}}$)</td><td>Three outputs indicating tape speed determined by binary coding
<table>
<tr><th>Tape speed (i.p.s.)</th><th>$\overline{\text{TOSS0}}$</th><th>$\overline{\text{TOSS1}}$</th><th>$\overline{\text{TOSS2}}$</th></tr>
<tr><td>45</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>37.5</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>25</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>18.75</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>12.5</td><td>1</td><td>1</td><td>0</td></tr>
</table></td></tr>
<tr><td>LOW SPEED
$\overline{\text{TOLOSPD}}$</td><td>The $\overline{\text{TOLOSPD}}$ signal is true to indicate that a transport operating speed of 25 i.p.s. or below has been selected.</td></tr>
</table>

6 EMI 8800 TAPE TRANSPORT SPECIFICATION AND TAPE FORMAT

6.1 EMI 8800 TAPE TRANSPORT SPECIFICATION

TAPE:	
WIDTH	12.7 mm (0.5 in.)
THICKNESS	38.1 μm (0.0015 in.)
SPECIFICATION	Computer grade ANSI Spec. X3.40-1973
TAPE TENSION	227 gm ± 14 gm (8 oz ± 0.5 oz)
REEL SIZE	178 mm (7 in); 216 mm (8.5 in); 267 mm (10.5 in)
INTERCHANGE FORMAT:	
9-TRACK	Format: NRZ, PE, Dual NRZ/PE. IBM ECMA compatible. Density: 31.5 b.p.mm (800 b.p.i.); 63.0 b.p.mm (1600 b.p.i.)
7-TRACK	Format: NRZ Density: 31.5/21.9 b.p.mm (800/556 b.p.i.) 21.9/7.87 b.p.mm (556/200 b.p.i.) 31.5/7.87 b.p.mm (800/200 b.p.i.)
HEAD	7- or 9-track; erase-write-read; long life option Read skew: 3.81 μm (150 μin) static + dynamic when reading master alignment tape Write skew: static skew fully-compensated
READ THRESHOLDS	5 thresholds for each of NRZ and PE modes; Read-whilst write, Read, Low Read and two test thresholds
NRZ DESKEW GATE	3 operational (+ one test) character assembly times for each density, controlled as for thresholds
TRANSPORT:	
SYNCHRONOUS SPEEDS	0.635 m/s (25 i.p.s.), 0.952 m/s (37.5 i.p.s.), 1.143 m/s (45 i.p.s.) Special options: 0.317 m/s (12.5 i.p.s.), 0.476 m/s (18.75 i.p.s.) Long term ± 2%; short term ± 3%
REWIND SPEED	6.1 m/s (240 i.p.s.) nominal
REWIND TIME	120 s typical over 732 m (2400 ft)
START/STOP DISTANCE	4.83 ± 0.51 mm (0.19 ± 0.02 in)
START/STOP TIME	8.4 ± 0.4 ms at 1.143 m/s (45 i.p.s.) 10.1 ± 0.5 ms at 0.952 m/s (37.5 i.p.s.) 15.2 ± 0.8 ms at 0.635 m/s (25 i.p.s.)
EOT/BOT	Infra-red detection
POWER REQUIREMENTS:	
SUPPLY	Voltage: 110, 115, 120 V a.c.; 220, 230, 240 V a.c. Frequency: 48-62 Hz (no fan) Power: 400 VA max.; 120 VA standby
PHYSICAL CHARACTERISTICS:	
DIMENSIONS	Height 606 mm (23.9 in); width 476 mm (18.7 in)
RACK MOUNTING	Hinge mounting in standard 19 in EIA rack Built-in rack strengthening bar Depth behind panel 290 mm (11.4 in) max. Forward of panel 80 mm (3.1 in) max. Weight: transport only 43 kg (94 lb) packed 58 kg (128 lb)
ENVIRONMENT:	
TEMPERATURE	Operating +10 to +45 deg C; Storage, -10 to +65 deg C Transit -40 to +70 deg C; Rate of change, 20 deg C/hr max.
HUMIDITY	Operating: 20 to 30% non-condensing Storage: 10 to 95% non-condensing; Transit 5 to 100%
ALTITUDE	Operating: 6000 m (20 000 ft) max; Transit 15000 m (50 000 ft) max.
VIBRATION	Operating: 0.1 g (3–15 Hz), 0.5 g (15–300 Hz)
SHOCK	Operating: 3 g, ½ sine pulse, 10 ms duration

6.2 TAPE FORMATS

6.2.1. NRZ Format

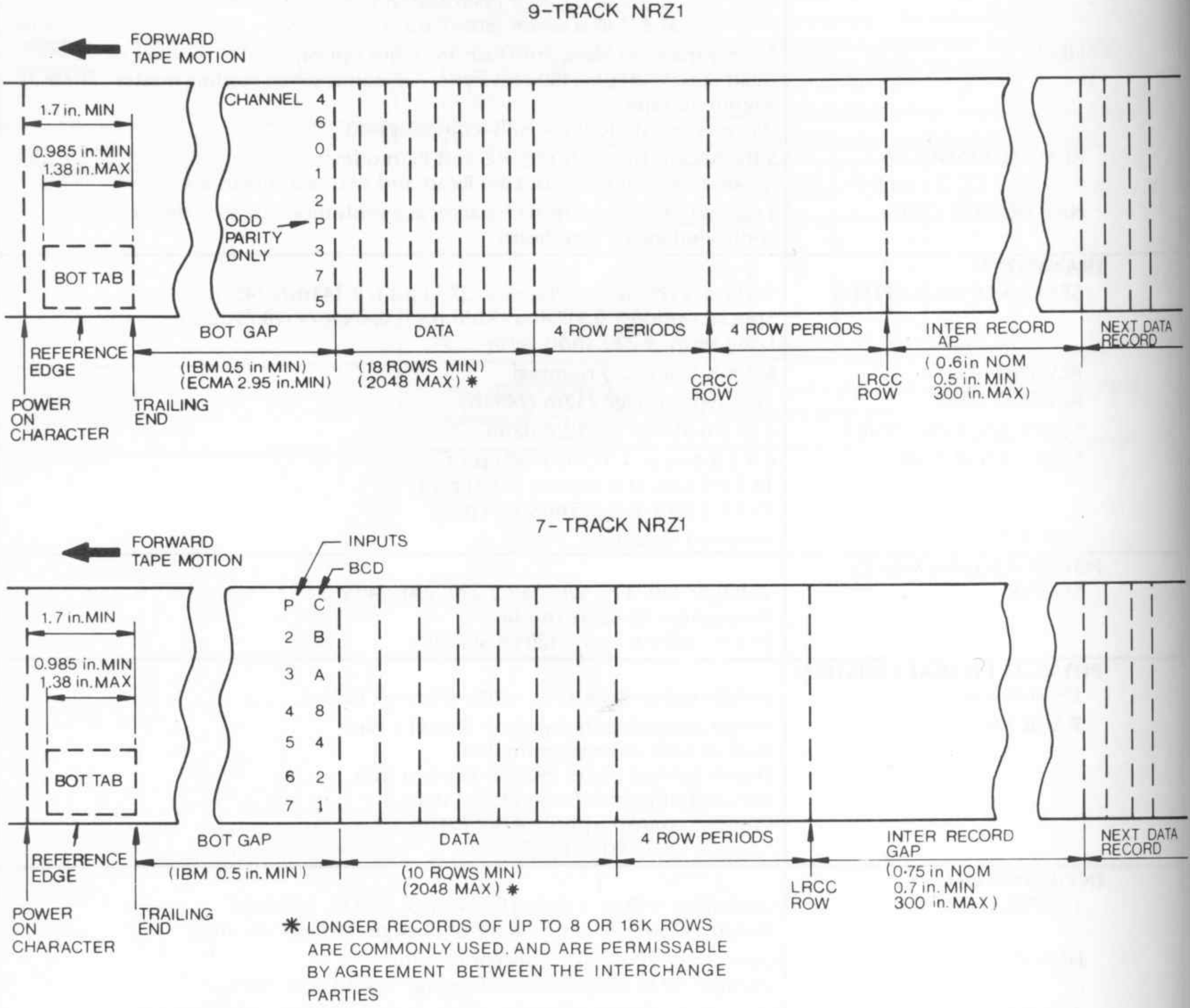
Non-Return-to-Zero (NRZ1) implies that a '1' bit is defined as a change of magnetisation polarity. Thus the frequency of flux changes in any one track can vary from zero up to the maximum data rate. Read strobes can only be derived provided at least one track in any row has a data '1' bit. Track allocations are shown in Fig. 6.1 together with minimum and maximum record size and inter-record gap (IRG). The NRZ Tape Mark Gap format is shown in Fig. 6.3.

(a) 9 Track NRZ — For IBM compatibility, 9-track NRZ transports must be 800 b.p.i. as shown in Fig. 6.1. At the end of each data record (**not** tape mark function records) a character is written on the tape for possible recovery of single track errors. This character is called the Cyclic Redundancy Check (CRC) character. A Longitudinal Redundancy Check (LRC) character follows, providing an even total of flux changes (data bits) along each track for every record.

Erased tape in the region of BOT must be in the minimum area specified in Fig. 6.1. In practice, for IBM compatibility, a minimum length of 76mm (3 in) of erased tape must be generated from the transport load position before the first record is written. For ECMA compatibility, the minimum length required is 140 mm (5.5 in).

(b) 7 Track NRZ — 7-track formats may be either 800, 556 or 200 b.p.i. and written in either odd or even vertical parity, although odd vertical parity is preferred. CRC characters are not required for 7-track and LRC characters may often be 'all zero' bits. Transport read circuits can be remotely switched from high to low packing density. The particular pair of densities can be chosen at the time of order, but note that except for very marginal 200 b.p.i. tapes, the 556 b.p.i. setting will be capable of reading 556 b.p.i. and 200 b.p.i. The IBM tape mark for 7-track differs from that of 9-track as shown in Fig. 6.1.

Where even vertical parity is used, an all zero data character is not permitted since this results in an all zero row. It is conventional in such instances to convert a zero binary character into an octal 12 character prior to writing.



✱ LONGER RECORDS OF UP TO 8 OR 16K ROWS ARE COMMONLY USED. AND ARE PERMISSABLE BY AGREEMENT BETWEEN THE INTERCHANGE PARTIES

FIG. 6.1 NRZ TAPE FORMAT

6.2.2 PE Format (9-Track only)

For phase-encoded tapes, a data '1' bit is defined as a change of magnetisation polarity in one direction, and a '0' bit is defined as a change in the opposite direction. Thus for consecutive identical bits, an additional change of polarity half-way between the nominal bit times is necessary. For PE systems, therefore, the number of flux changes per inch will be a maximum of 3200f.c.i and a minimum of 1600f.c.i. for a nominal packing density of 1600b.p.i.

The tape format is defined in Fig. 6.2. Each data record must be preceded by a preamble — nominally 40 zeroes followed by an 'all-ones byte' — and completed by a postamble consisting of an 'all ones byte' followed by 40 zeroes. This allows for synchronisation of read circuits in either the forward or reverse mode.

PE data records of 82 bytes at 1600b.p.i. are comparable in length to NRZ data records of 82 bytes at 800b.p.i, so that economic use of tape for PE occurs only for data record lengths in excess of 82 bytes.

The format of PE Mark Tape Gap is shown in Fig. 6.3. For IBM compatibility, the file mark is 40 zero bits written in IBM tracks p, 0, 2, 5, 6, and 7. Tracks 1, 3 and 4 are d.c.-erased. The file mark may be preceded by 3.5in of erased tape, and followed by a conventional IRG of 0.6in.

The PE identification burst over the BOT tab is a series of alternate ones and zeroes in track P, and should be of sufficient duration to extend from LOAD POINT position to beyong the BOT tab as indicated in Fig. 6.2. A minimum length of 13mm (0.5in) of erased tape must follow the identification burst, and the first record must be written at least 76mm (3in) from the trailing edge of the BOT tab.

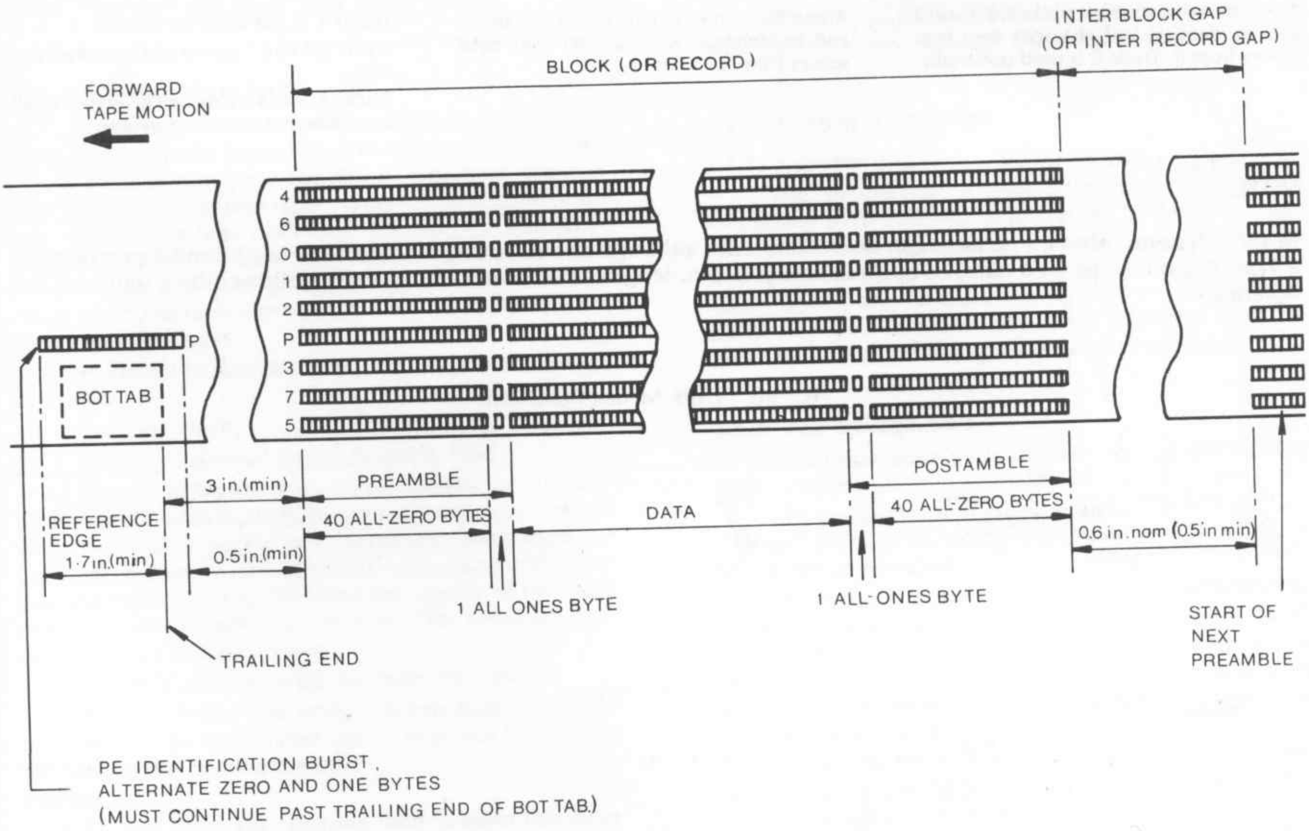
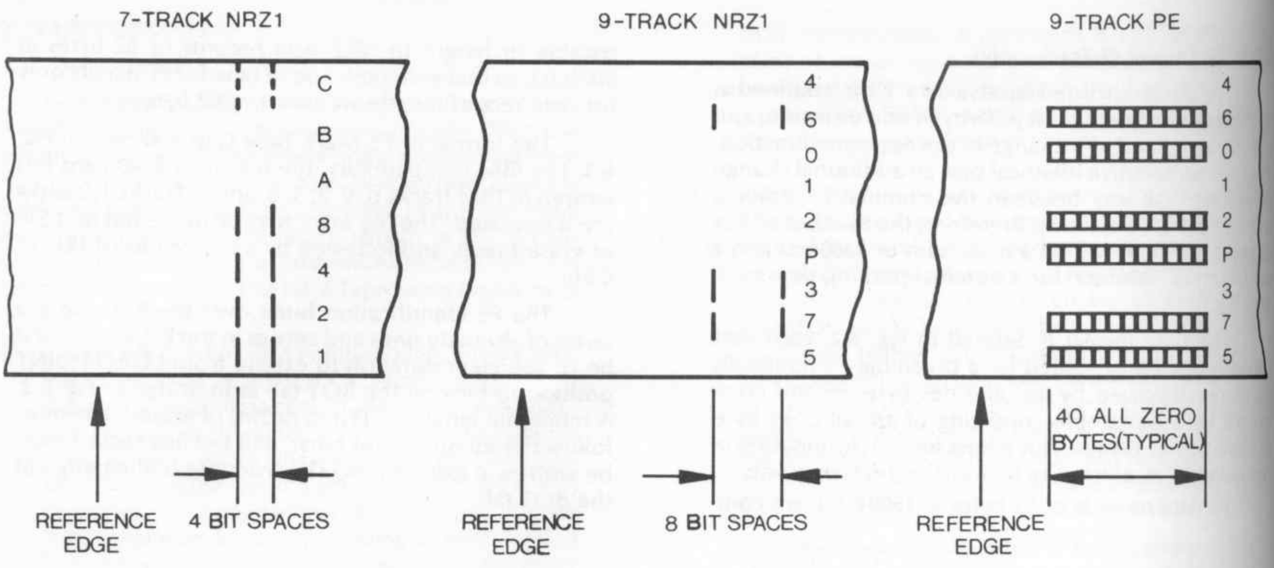


FIG. 6.2 PE TAPE FORMAT



A one bit written in data tracks 1, 2, 4 and 8 and an identical LRC character four byte spaces from it. Track C is used optionally.

A one bit written in data tracks 3, 6 and 7, and an identical LRC character eight byte spaces from it.

Tracks 1, 3 and 4 are DC-erased.

Tracks 2, 6 and 7 consist of 32 to 128 all-zero bytes.

Tracks P, 0 and 5 may be DC-erased or all-zero bytes (in any combination).

NOTE:

In some systems other bit patterns can be utilized. Also although not a requirement the Tape Mark can be preceded by a Tape Mark Gap (erased tape) of approximately 3.75in. length (3.9in. for 7-track) and is followed by a standard IRG distance.

FIG. 6.3 TAPE MARK FORMAT

7 TAPE AND TRANSPORT CARE

7.1 INTRODUCTION

The tape transport is designed to operate with minimum maintenance. However, it is important to maintain a clean tape path. This should be accomplished by routine cleaning carried out at the start of each operational day, or after each eight hours operation. Dirty or contaminated tapes must be cleaned before use.

In addition to care of tapes and tape path components, the transport casting and dustcover door should be cleaned weekly, using a damp lint-free cloth. The tape cleaner should be removed and blown clean when necessary (approximately every 40hrs).

7.2 CLEANING TAPE PATH

At the start of each working day it is necessary to clean the tape path. Ensures that the tapes employed are always clean and in good condition, otherwise dirt may be transferred from one tape to another. It is good practice to clean the tape path after the use of a new tape. During the first few passes, new tapes may deposit oxide on the head and fixed guides which should be wiped clean when the tape is removed. Refer to Section 7.5 for recommended tapes.

To clean the tape path, the following two items are essential:

(a) Lint-free cloth,
(b) Isopropyl-alcohol based cleaning fluid.

These can be purchased individually, or as a proprietary item, which combines (a) and (b) in a pre-soaked swab in a sealed packet (e.g. Texwipe). Once used the pre-soaked swab must be thrown away. Particular attention should be paid to the 'lint-free' quality of the cloth used. If not completely lint-free, the resultant hair deposits may cause damage.

Water is also required, to clean the capstan.

Rough cloths, and other solvents such as carbon tetrachloride or methylated spirits, must not be used, as damage to the head will result.

CAUTION:

(1) **Do not allow any cleaning fluid to enter the roller bearings.**
(2) **Use only water for cleaning the capstan surface.**

Roller bearings are pre-greased and cleaning fluid must be used sparingly when cleaning the rollers.

Clean the following items at every cleaning operation:

Head surface
Fixed guides on head plate
Tape cleaner surface
Capstan surface (use water only)

Examine the rollers and clean them only when necessary.

NOTE: The lower (take-up) spool must be clean and squarely seated. Reel flanges must not be distorted and must not touch the tape during operation.

7.3 TAPE CLEANER

The tape cleaner is located within the transport head area, beneath the left head cover plate. Access to the assembly is achieved by withdrawing the head cover plate from the mounting spigots (Fig. 5.5).

If, after inspection of the tape cleaner foil, cleaning is necessary, the tape cleaner should be removed by unscrewing the large knurled-head retaining screw (Fig. 5.5). The body of the tape cleaner is retained by this screw and is located by a small dowel pin which ensures correct positioning when refitting. Dust and oxide particles should be blown off the tape cleaner.

To refit, re-position the tape cleaner and tighten the knurled screw. Replace the head cover.

7.4 GENERAL TAPE CARE

7.4.1 Introduction

The properties of magnetic tape coatings are essentially permanent until altered by an external magnetic field. Data loss over long periods is usually due to physical damage rather than magnetic particle alteration. Operators must therefore preserve the tape in a good physical condition and great attention must be given to handling habits and storage procedures.

7.4.2 The Storage Area

Tape operation and reliability will benefit from as little temperature and humidity change as possible.

An ambient temperature of between 16 deg C and 32 deg C (60 deg F to 90 deg F) and a relative humidity of 50% is recommended.

Protection from accidental erasure while in storage is easily accomplished since magnetic fields strong enough to cause erasure are not normally found in an 'office' atmosphere. A spacing of 76 mm (3 in) from even a strong magnetic source should be sufficient to offer adequate protection.

A clean room environment in both the storage and working areas should be maintained to reduce contamination of tapes to a minimum.

7.4.3 Reel Handling

The reel should always be handled by its hub and, in storage, supported by its hub in its canister. The canister also protects the reel from dust.

The closed canisters should be stored in an upright position but if horizontal storage is necessary, they must not be stacked so high as to cause crushing and damage. For long term storage, canisters should be sealed in plastic bags, and should be cleaned prior to bringing in to the computer room.

7.4.4 Tape Care

The way in which tape is wound on the reel is as important as good handling and storage.

Recommended tension is between 170gm (6oz) and 227gm (8oz) for ½in tape width.

Permanent distortion of the polyester backing may result from too high tension. Too low tension can cause 'cinching' or slippage between tape layers and a series of creases or folds in the slipped area with possible loss of data.

Another important consideration is wind 'quality', i.e. placing the tape on the reel so that no individual tape strand is exposed and therefore vulnerable to damage. One method of reducing this possibility is to adopt a programme of regular winding, rewinding and relaxing of the stored tapes in the operating environment, every six to nine months. Tapes in a tape library should be regularly inspected.

When transporting tapes from one location to another, it is essential to provide a water resistant container. The end of the tapes should be secured by a hold-down sponge and a vinyl strip.

As a general rule, packaging which is adequate to prevent physical damage is also sufficient to prevent accidental magnetic erasure.

7.4.5 Operator Education

Tapes which are not actually being used must be kept in canisters. The canister cover must be in place, even on an empty canister, and must not be removed out of the clean room environment.

Reels must be handled by the hub only and NOT BY THE FLANGES.

Frequent cleaning of the tape drive will reduce the chance of spreading contamination. If the transport and read/write heads are contaminated by dust from one tape, the rest of the entire library may easily become contaminated.

A cotton swab or lint-free cloth, moistened with cleaning solvent (Section 7.2) should be used to clean all elements of the tape path except **the capstan surface which must be cleaned with water only.**

Empty reels should be thoroughly inspected to be clean and undamaged before winding tapes on to them. The transport should be inspected in the areas of the guides and heads for excessive build-up of oxide or backing debris.

7.5 RECOMMENDED TAPE TYPE

3M (Scotch) 777.

7.6 HEAD WEAR

The head should be periodically inspected for wear. For full details refer to the EMI 8800 Servicing Manual (CM.1029). For prolonged head life, hard-coated heads are optional. These heads have a typical life of at least three times that of a conventional 'soft' head.

8 VARIANTS AND OPTIONS

8.1 MODEL IDENTIFICATION

An identification label is affixed to the rear of the tape transport deck casting (Fig. 9.2) indicating the number of tracks, tape speed and data density.

e.g. 9T, 37.5 i.p.s., 800/1600 b.p.i, which would indicate a dual NRZ/PE capability.

8.2 OPTIONAL PACKAGES

8.2.1 Customer Logo

Standard formats giving a choice of colour co-ordination and customer logo are available to OEM customers.

8.2.2 Long-Life Head

A Long-life head may be fitted to extend the normal life by at least three times.

8.2.3 Transport Select Switch

A front panel mounted thumbwheel switch (Section 4.2, Table 4.1) can be provided. This will enable the transport address to be allocated as any one of eight, in a daisy-chain configuration from 0 to 7. When this option is required, an additional green indicator is fitted to the transport front panel. This indicator is illuminated when the transport has been selected for operation by the formatter.

8.2.4 Elapsed-Time Indicator

A mechanical elapsed-time indicator with a digital read-out is available. This records the time that the tape is tensioned and it is mounted on a fixing bracket which is supplied as part of the option.

8.2.5 Green Mains Indicator

Transports are normally fitted with a red mains indicator. This can be replaced by a green indicator, if required.

8.2.6 Tape Speeds

Transports are normally supplied to operate at tape speeds of 25, 37.5 or 45 i.p.s., but optional speeds of 12.5 and 18.75 i.p.s. can be provided.

8.2.7 Parking Brakes

This option can only be fitted to indirect drive transports. With parking brakes fitted, tape tension is retained even when power is removed, so that no tape loops are thrown and Remote LOAD and ON LINE input commands can be used with confidence and without supervision.

8.2.8 Switched Mains Outlet

A separate power outlet cable, controlled by the transport power switch, can be provided to supply related equipment requiring the same input supply, limited to a maximum current of 1 A at 230 V, 2 A at 115 V.

8.2.9 Multiple Transport Adaptor

An adaptor can be provided to enable the EMI 8800 transport to conform with any multi-transport system.

NOTE: Daisy-chaining, when using EMI 8800 transports and formatters, does not require a multiple transport adaptor.

8.2.11 Transport-Mounted Formatter

This is a single printed circuit board dual (NRZ/PE) formatter, mounted at the rear of the transport, and powered by the transport power unit (Fig. 9.2).

The formatter provides for NRZ/PE, 200/556/800/1600 b.p.i.; with daisy-chain capability for up to 8 transports.

The controller/formatter input has an alternate mode so that full compatibility, with other existing formatters, can be achieved.

The capability of the Micro-diagnostics unit can be extended to include formatter tests on status, timing and data transfers.

Refer to Section 9 for full details of the formatter.

8.2.10 D.C. Power Supply

The standard mains-operated power supply can be replaced by a d.c./d.c. converter, operated from +48 V d.c.

8.3 ORDERING INFORMATION

8.3.1 Transport Definition

The following items define the EMI 8800 tape transport:

(a) Supply Voltage and Frequency

$\left.\begin{array}{l}110\text{V, } 115\text{V, } 120\text{V} \\ 220\text{V, } 230\text{V, } 240\text{V}\end{array}\right\}$ 50 to 60 Hz

110V and 240V selectors are both normally supplied.

(b) Number of Tracks (7T or 9T)
  (i) If 7T, define packing density pair (800/556 b.p.i.; 556/200 b.p.i.; 800/200 b.p.i.).
  (ii) If 9T, define whether Single (NRZ or PE) or Dual (NRZ/PE) recording modes.

(c) Tape speed (i.p.s.)
12.5, 18.75, 25, 37.5 or 45.

(d) Define:
  (i) Direct or Indirect Drive
  (ii) Arm Drive or Non-Arm Drive
  (iii) With or Without Micro-diagnostics

(e) Interface Configuration
Refer to Section 5.6.

(f) Options
Refer to Section 8.2.

(g) Ancillary Equipment
Refer to Section 8.4.

8.3.2 Model Numbering (EMI 8800 Transport, Transport-mounted Formatter and Options)

NOTE: The model number can appear thus:
8810/9/D/37/XX . . . (up to 15 Alpha) . . . XX/220

Model Number Digit	Digit	Definition of Digit
1st and 2nd	88	Indicates Tape Transport series, will always be 88
3rd	1	Without Transport-mounted Formatter.
	2	With Transport-mounted Formatter.
4th		Indicates arm-drive, direct-drive and diagnostics.
		Arm Drive / Direct Drive / Diagnostics
	0	- - -
	1	- - X
	2	- X -
	3	- X X
	4	X - -
	5	X - X
	6	X X -
	7	X X X
5th	9	Indicates 9-track
	7	Indicates 7-track NRZ only, 800/556 b.p.i. (7-track Formatter is a special)
6th	P	PE
	N	NRZ
	D	DUAL
7th and 8th	45	45 i.p.s.
	37	37.5 i.p.s.
	25	25 i.p.s.
	18	18.75 i.p.s.
	12	12.5 i.p.s.
9th to 23rd (maximum)	Options:	
	A	Switched a.c. mains outlet
	B	Parking Brakes
	C	Customer Logo (Colour strip other than black)
	D	D.C. Power Supply
	E	Elapsed Time Indicator
	F	Formatter Diagnostics Adaptor
	G	Formatter manual (CM.1031)
	H	Hard head
	I	Current Mode Adaptor (Formatter)
	M	Transport Servicing manual (CM.1029)
	N	8500/8600 Formatter compatible Interface
	Options:	
	P	Pertec compatible Interface (Formatter)
	R	Read Only
	S	Fast Search
	T	Twisted pair Formatter Connector and pins
	U	Transport Select Switch
	X	Special (e.g. Link option or Green mains indicator etc.)
Last three digits	240	240 V a.c.
	230	230 V a.c.
	220	220 V a.c.
	120	120 V a.c.
	115	115 V a.c.
	110	110 V a.c.

8.3.3 Model Numbering (EMI 8800 Formatter Rack or Transport Mounting Kit)

NOTE: The model number can appear thus:
8831/9/D/N/X . . . up to 4 Alpha . . . X/220

Model Number Digit	Digit	Definition of Digit
1st and 2nd	88	Indicates product series, always 88
3rd	3	Formatter only
4th	1	Rack-mounted
	2	Transport mounting kit
5th	9	Indicates 9-track
	7	Indicates 7-track (a special formatter)
6th	P	PE
	N	NRZ
	D	DUAL
7th	N	8500/8600 Compatible Interface
	P	Pertec Compatible Interface
8th to 11th (maximum)	Options:	
	F	Formatter Diagnostics Adaptor
	G	Formatter Manual (CM.1031)
	I	Current Mode Adaptor (Formatter)
	X	Special
Last three digits	240	240 V a.c.
	230	230 V a.c.
	220	220 V a.c.
	120	120 V a.c.
	115	115 V a.c.
	110	110 V a.c.

8.4 ANCILLARY EQUIPMENT

8.4.1 EMI 8831 Formatter (Rack-mounted)

As described in Section 8.2.11 and Section 9 but housed for standard rack-mounting, with a 3.5 in (88.9 mm) panel height, and an integral power unit.

This form of mounting has provision for up to two additional printed circuit boards for special interfaces.

8.4.2 Data General Nova/Eclipse Interface

This is a single printed circuit board interface, which is mounted within the computer, and provides an interface to the EMI 8830 series formatters. A set of computer programs is included.

8.4.3 PDP 11 Interface

A printed circuit board, mounted within the computer, which provides an interface to the EMI 8830 formatter.

8.4.4 Buffered Formatters

To become available.

9 EMI 8830 DUAL FORMATTER (OPTION) — TRANSPORT MOUNTED OR RACK MOUNTED

9.1 INTRODUCTION

The tape transport requires a formatter to enable operation with a computer or similar interface. The formatter arranges the NRZ1 or PE tape format as instructed and provides timing controls for data density, inter-record gaps, start/stop delays, check character positioning, generation of parity track, check characters, file marks, preambles, postambles, status and error monitoring, data deskewing, interface handshakes, and other formatting duties necessary for writing and reading. Refer to Section 6.2 for details of the tape formats.

9.2 CONFIGURATION

The EMI 8830 Dual Formatter can connect up to 8 tape transports, in a daisy-chain configuration (Fig. 9.1). Computer interfaces are more commonly housed within the computer and a range of interfaces and software is available (refer to Section 8.4).

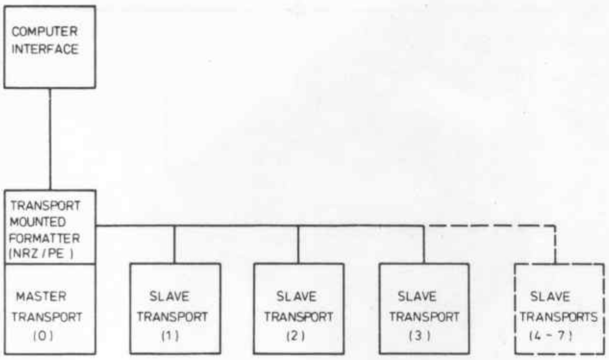


FIG. 9.1 MULTIPLE TRANSPORT CONFIGURATION

The formatter consists of a single board which can either be mounted on the tape transport (Fig. 9.2) or housed in a self-contained rack-mounting box (Fig. 9.3). When mounted on the tape transport, the formatter obtains its power from the 'master' transport power unit. *NOTE: The rack-mounted formatter power unit has a voltage selector plug identical to the tape transport (refer to Section 2.2.1). Access being achieved by the removal of the formatter box top panel.*

In the multiple transport configuration (Fig. 9.1), the transports can be a mixture of 9-track NRZ, PE or DUAL, 7-track versions are available to special order. It is also possible to mix the tape transport speeds in any combination. Transport addresses are shown as 0–7, and these can be interconnected in any order. The optional transport front panel SELECT switch (refer Section 8.2.3) is provided where it is necessary for the operator to change transport addresses, otherwise the transport addresses are set by the dual in line (DIL) switch (SW1), located on the Servo board (refer Section 4.3.5).

Located on each of the Servo and Write Data boards is a 14 pin DIL 220/330 ohm terminator package which must be removed from the sockets on the boards from each transport shown in Fig. 9.1, with the exception of the transport at the end of the daisy-chain row. To ensure terminator power at the end of the daisy-chain row, alternate link positions are provided on the Servo (Link 15) and Write Data (Link 1) boards which enable the terminator packages to be powered from the formatter (Fig. 9.4).

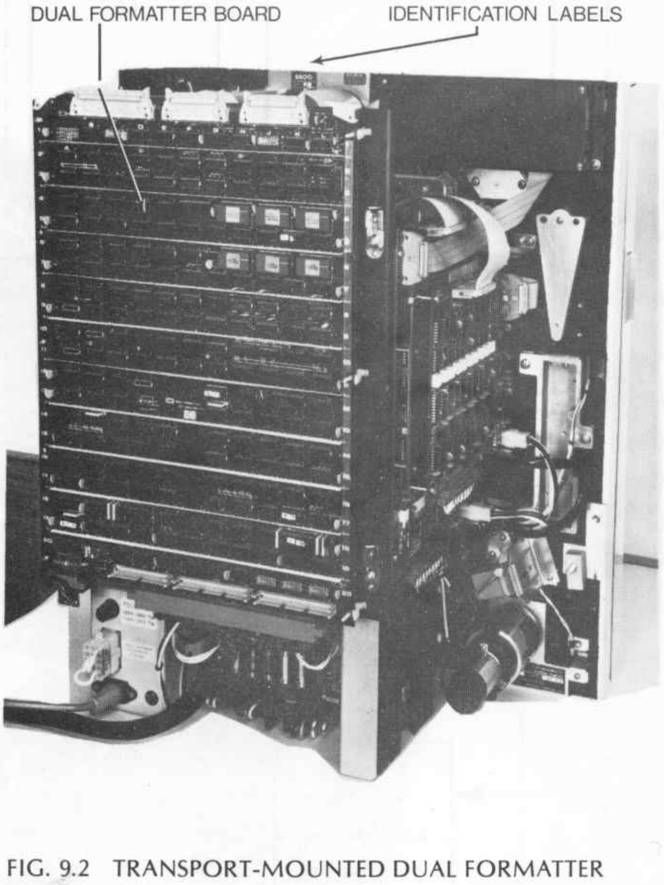


FIG. 9.2 TRANSPORT-MOUNTED DUAL FORMATTER

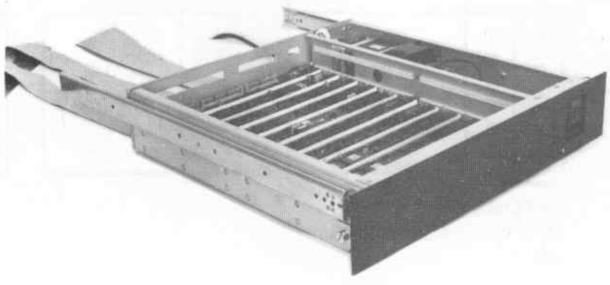


FIG. 9.3 RACK MOUNTED DUAL FORMATTER

A formatter with a single tape transport does not require changes to either the terminator DIL packages or the terminator power links.

If the 'slave' transports have enhanced power units (refer Section 9.5), then the 'slave' and 'master' transports are identical except for the signal terminations and transport addresses already described.

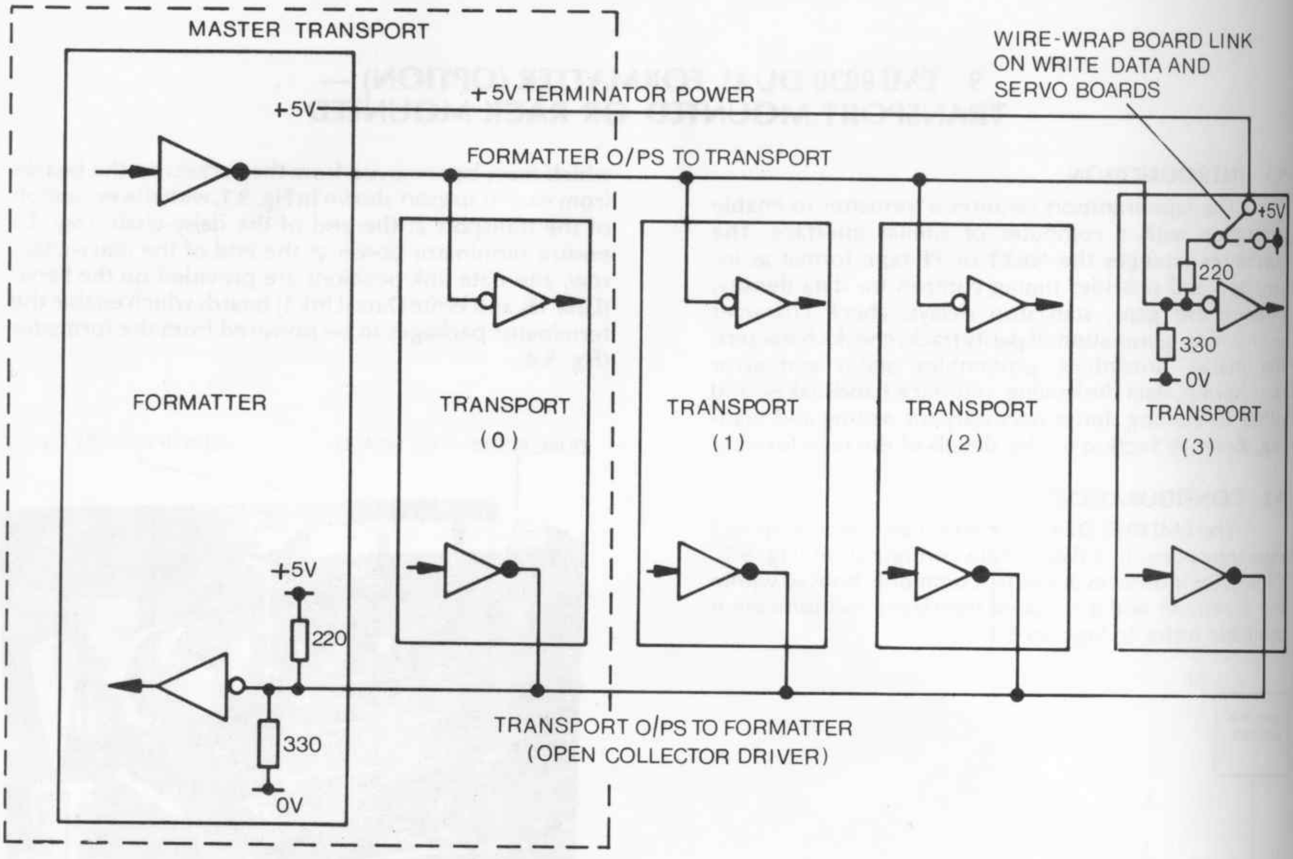

MASTER TRANSPORT
+5V TERMINATOR POWER
WIRE-WRAP BOARD LINK ON WRITE DATA AND SERVO BOARDS
+5V
FORMATTER O/PS TO TRANSPORT
+5V
220
330
0V
FORMATTER
TRANSPORT (0)
TRANSPORT (1)
TRANSPORT (2)
TRANSPORT (3)
+5V
220
330
0V
TRANSPORT O/PS TO FORMATTER (OPEN COLLECTOR DRIVER)

FIG. 9.4 FORMATTER/TRANSPORT SIGNAL TERMINATIONS

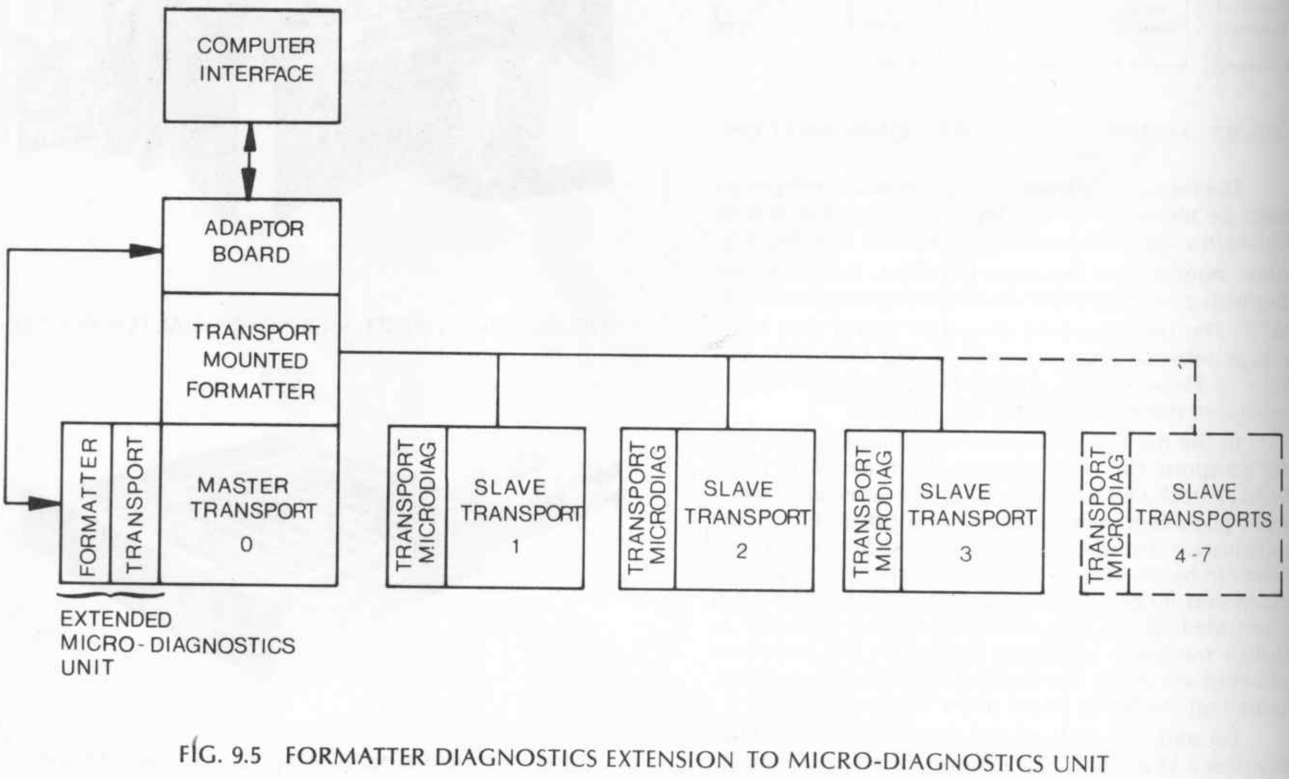


FIG. 9.5 FORMATTER DIAGNOSTICS EXTENSION TO MICRO-DIAGNOSTICS UNIT

9.3 CONNECTOR VALIDATION

Connector validation of the transport/formatter ribbon cables is enabled by the Servo board DIL switch (SW1), position 7 (refer Section 4.3.5) of each transport. The transport MONITOR indicator will fail to illuminate at switch-on if the formatter cables are disconnected.

9.4 FORMATTER DIAGNOSTICS (OPTION)

An extended Micro-diagnostics Unit (Fig. 9.5), with a formatter diagnosis capability, can optionally replace the existing 'master' tape transport Micro-diagnostics Unit. Used in conjunction with an adaptor board mounted with the formatter, it provides transport and formatter checks in addition to full system data checks on any of the transports of the daisy-chain.

9.5 INSTALLATION

To install a dual formatter within the tape transport (i.e. the transport-mounted formatter configuration) proceed as detailed in Sections 9.5.1 and 9.5.2 following:

9.5.1 Tape Transport Power Unit

Check that the power unit is the Enhanced Type 79740, suitable for the transport-mounted formatter. To recognise the Enhanced Type 79470, with reference to Fig. 9.6, a small heat sink with two stud-mounted diodes is located at the right hand outer edge of the power unit.

If the power unit is not the Enhanced Type 79470, an Enhancement Kit Type 79444 must be obtained (refer Fig. 9.7). It is then necessary to disconnect the power input lead, remove the power unit and fit the enhancement kit parts in accordance with the instructions provided, with reference to Fig. 9.8 (enhanced power unit circuit details). For full details of the power unit, before enhancement refer to CM.1029–EMI 8800 Tape Transport Servicing Manual (Section 3).

Note the inclusion of a protective edging strip and a 'P' clip as part of the kit and as shown in Figs. 9.6 and 9.7.

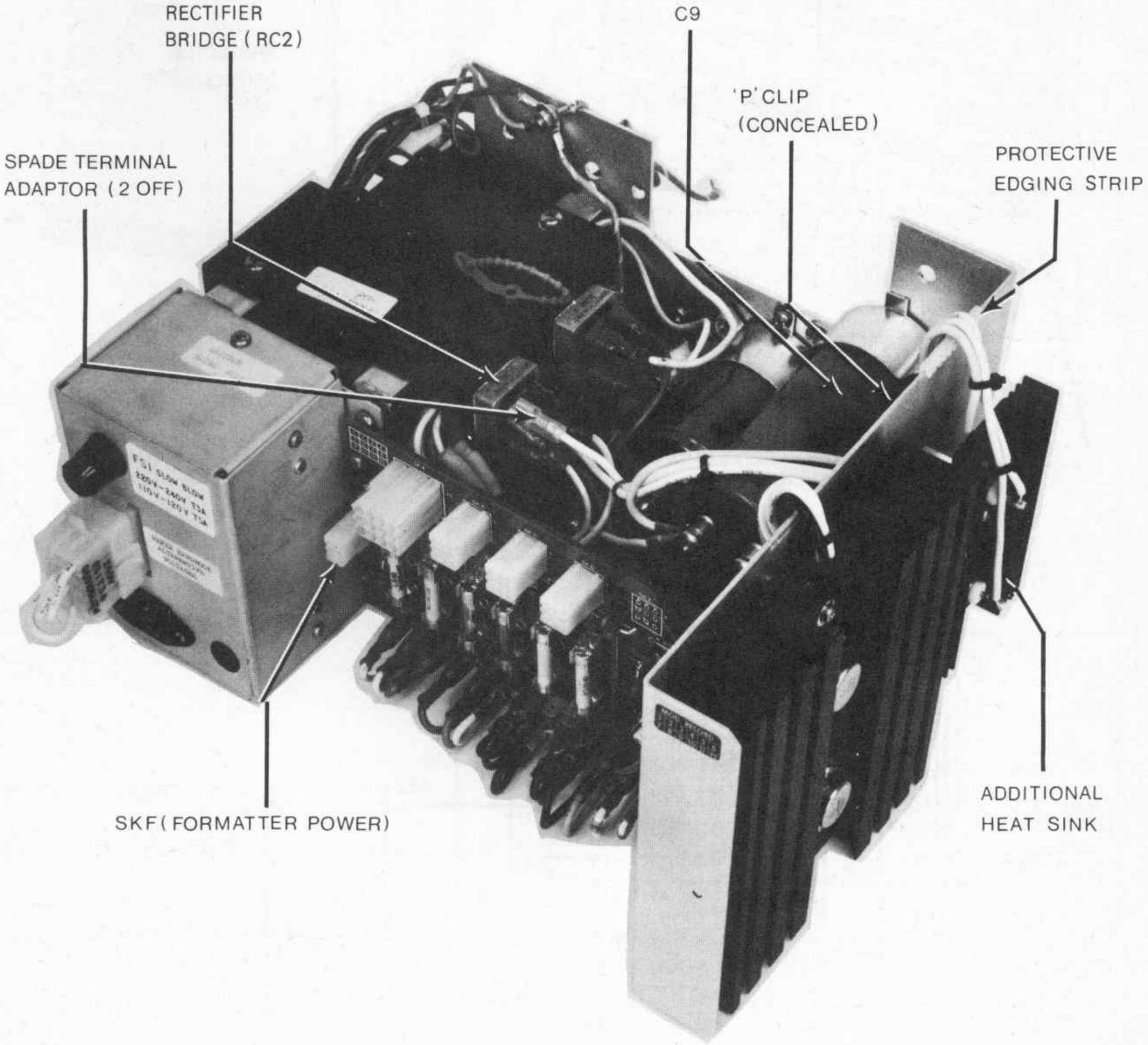


FIG. 9.6 ENHANCED POWER UNIT TYPE 79470

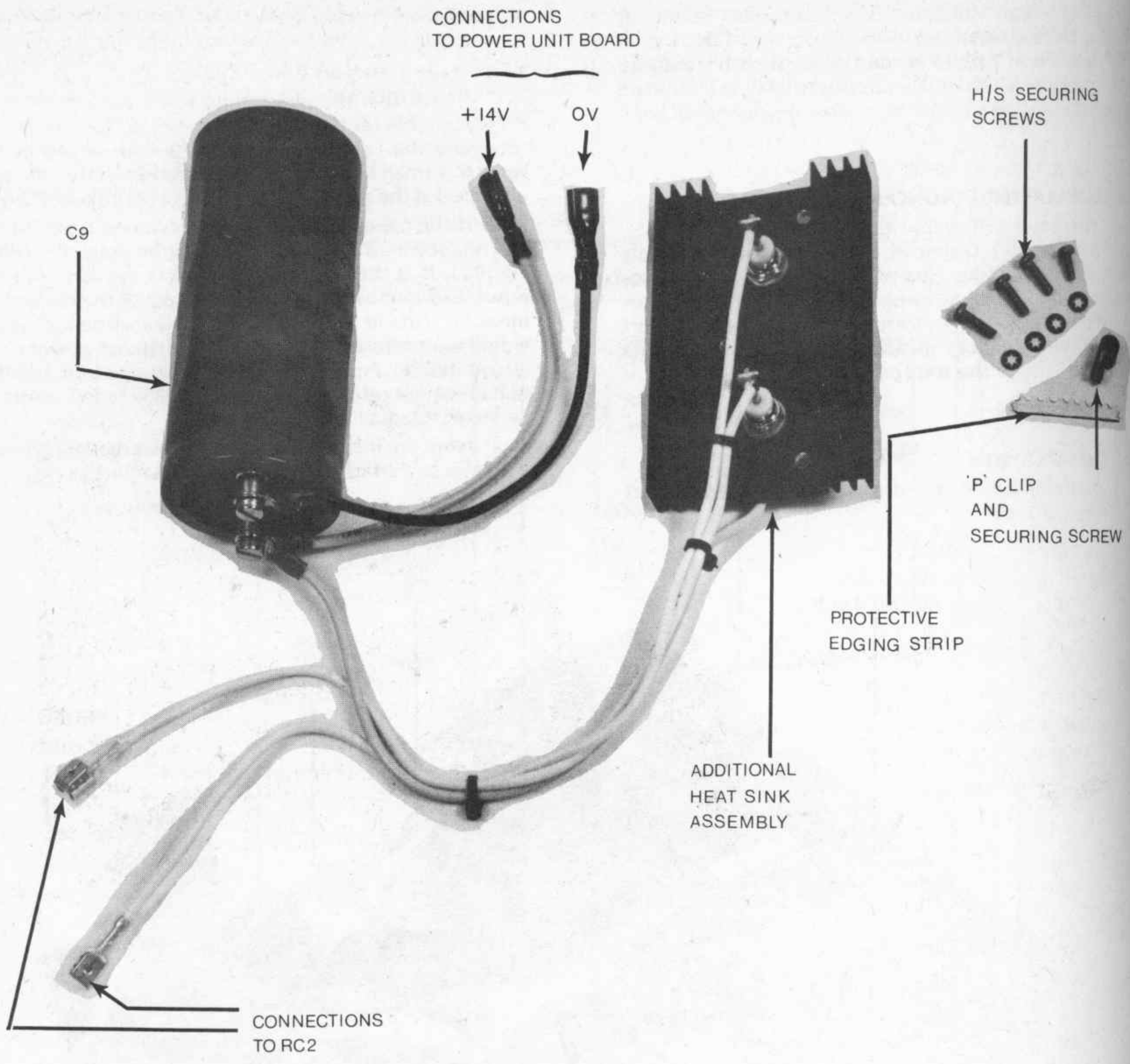


FIG. 9.7 POWER UNIT ENHANCEMENT KIT

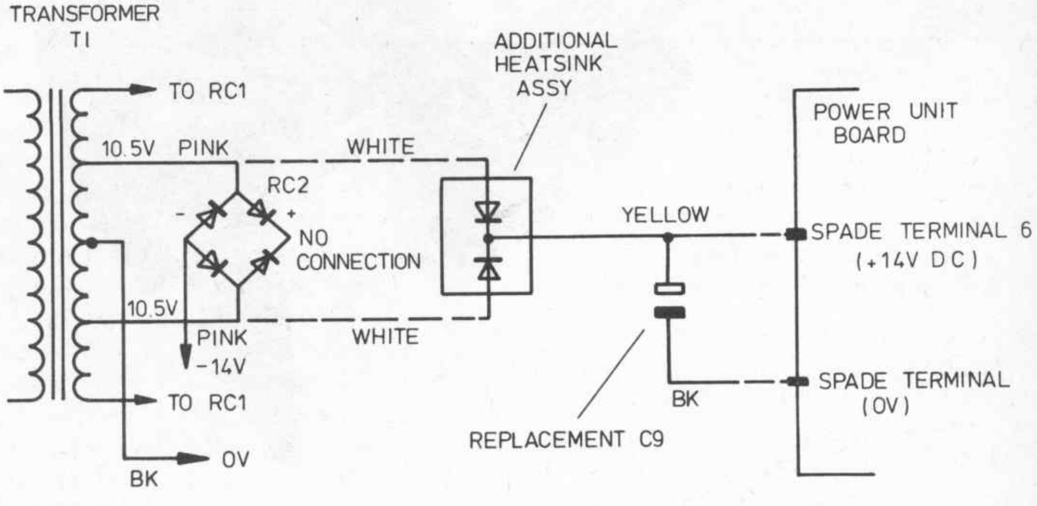


FIG. 9.8 ENHANCED POWER UNIT;
CIRCUIT DETAILS

9.5.2 Dual Formatter Transport Mounting Procedure

The main components of the transport-mounted formatter kit are shown in Fig. 9.9. and an item list is detailed in Table 9.2. An assembly diagram is also provided (Fig. 9.10) and the transport-mounted formatter interconnection details are shown in Fig. 9.11.

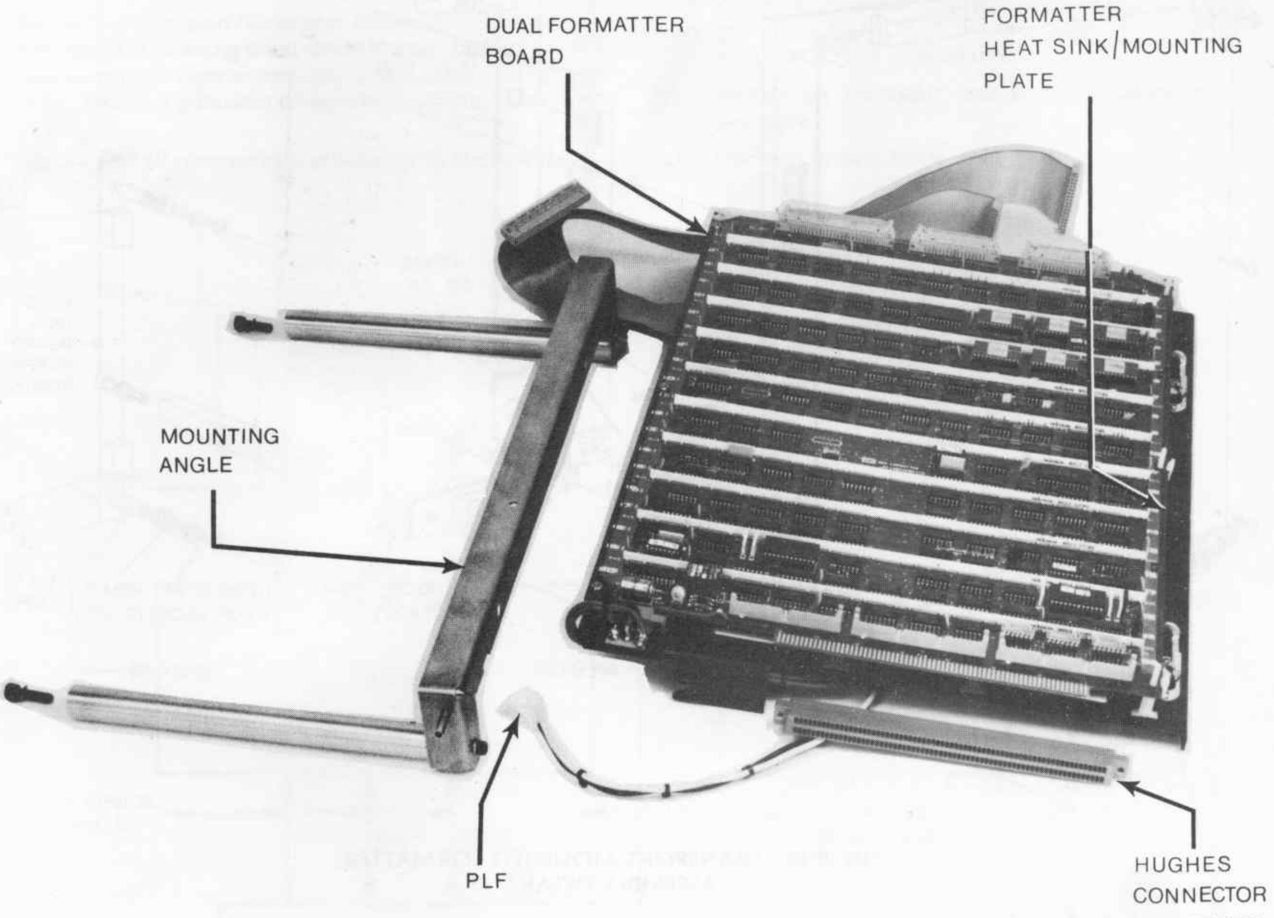

DUAL FORMATTER BOARD
FORMATTER HEAT SINK/MOUNTING PLATE
MOUNTING ANGLE
PLF
HUGHES CONNECTOR (COMPUTER INTERFACE)

FIG. 9.9 TRANSPORT-MOUNTED FORMATTER KIT

TABLE 9.1

TRANSPORT MOUNTED FORMATTER KIT ITEM LIST

Item No. (Fig. 9.10)	Stock or Drwg. No.	Description	No. Off
1	PL 79250	Formatter Board	1
3	PL 79373	Servo Board/Formatter Loom	1
4	PL 79374	Write Data Board/Formatter Loom	1
5	PL 79375	Read Data Board/Formatter Loom	1
7	PL 79930	Formatter Heatsink Assembly	1
8	PL 79264	Mounting Angle	1
9	PL 79477	Mounting Pillar	2
10	PL 79265	Latch Spacer	2
11	PL 78990	Hinge Block Spacer	1
15	WS 60741	Bush, Slide Latch	3
16	PL 78836	Anti-vibration buffer	4

Item No. (Fig. 9.10)	Stock or Drwg. No.	Description	No. Off
17	SS 24321	Adhesive	
19	YS 40689	Screw, Skt. Cap M4×30	2
20	YS 40108	Screw, Pan Pozidrive M5×20	2
21	YS 40681	Screw, Pan Pozidrive M4×35	2
22	YS 40098	Screw, Pan Pozidrive M4×16	1
25	YS 40386	Nut, Hexagonal M4	1
27	YS 40448	Washer, Single Coil Spring M6	2
28	YS 40447	Washer, Single Coil Spring M5	2
29	YS 40446	Washer, Single Coil Spring M4	3
31	YS 40402	Washer, Stud M4	2
32	YS 40461	Washer, Crinkle M3	3
34	YS 41530	Screw, Self Tap Type AB $(4\times\frac{5}{16})$ pan	3

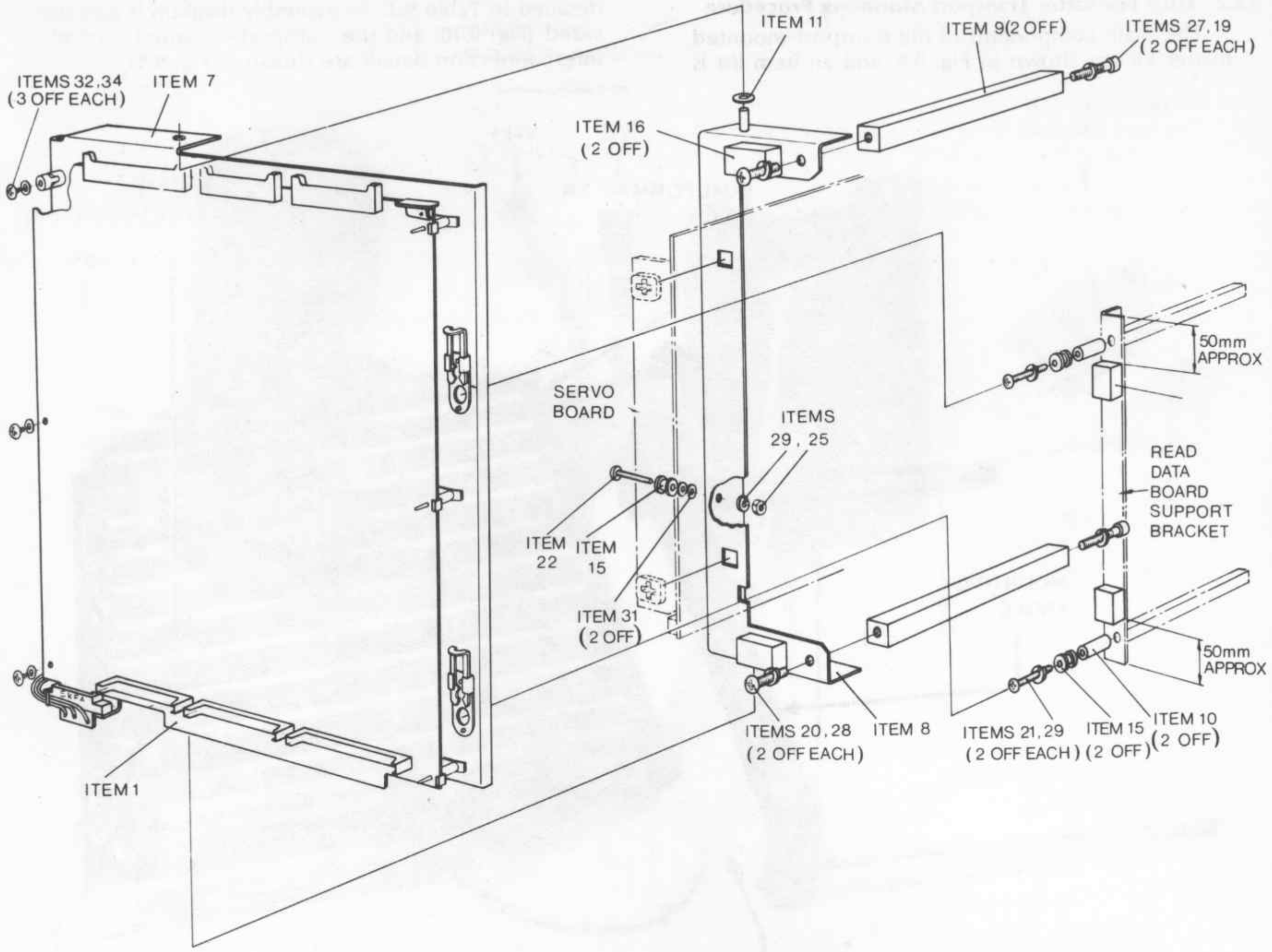


FIG. 9.10 TRANSPORT-MOUNTED FORMATTER: ASSEMBLY DETAILS

With reference to Table 9.2 and Fig. 9.10 proceed as follows:

(a) Disconnect the power supply lead from the transport power unit. Check the power unit type (refer Section 9.5.1).

(b) Remove the transport front fascia cover plate (5 quick-release screws).

(c) Hinge open the Write Data Board.

(d) Disconnect and remove the Read Data Board (refer Section 5.4.7).

(e) Disconnect and remove the Servo Board (refer Section 5.4.4) and hinge open the Servo heatsink assembly (refer to Section 5.4.5).

(f) Remove and discard the Read Data Board support bracket securing screws. Replace them with the new screw assemblies (Items 10, 15, 21, 29).

(g) Using the adhesive (Item 17) glue the anti-vibration buffers (2 off — Item 16) in position on the Read Data board support bracket as shown.

(h) Remove and discard the Servo Board mounting bracket and mounting pillars (2 off).

(j) Assemble the new mounting pillars (Item 9) in the higher and lower transport casting holes using the cap-headed screws (Item 19) and washers (Item 27). Tighten these screws to a torque of 6.2Nm (55lb/in).

(k) Fit the mounting angle (Item 8) to the new pillars, together with the anti-vibration buffers (2 off — Item 16) which are glued to the mounting angle in the positions shown.

(l) Fit the heatsink catch retaining screw assembly (Items 22, 15, 31, 29, 25), if not already fitted.

(m) Locate the hinge block spacer (Item 11) over the top pivot post.

(n) Refit the Read Data and Servo Boards.

(p) Assemble the Dual Formatter board (Item 1) to the formatter heatsink mounting plate (three knuckle assemblies together with three push-on retainers). Note that two non-metallic deflectors mount on push-on retainer clips located beneath the Formatter Board.

(q) Hinge the formatter board away from the mounting plate and fit the SKAF edge connector.

(r) Fit the three transport-formatter ribbon cable looms (Items 3, 4, 5) to SK19, 20, 21 (Fig. 9.11) on the Formatter Board. The looms are then routed behind the formatter, above the deflector and towards the hinged edge of the board. Close and lock the formatter board to the formatter heatsink mounting plate, thereby retaining SKFA which can then only be removed with the formatter board in the hinged open position.

(s) If an adaptor board is required (refer Section 9.4), this is mounted in the same way as the formatter board, on to the rear of the formatter heatsink mounting plate.

(t) Offer the formatter assembly to the mounting angle (Item 8), locating the upper hinge through the top pivot hole. When located, guide the lower 'V' slot over the lower hinge pin.

(u) Route the transport/formatter ribbon cables over the upper mounting pillar (Item 9) and connect to the transport connectors (SK1, SK2, SK3 — Fig. 9.11). Use the adhesive ribbon cable clamps provided.

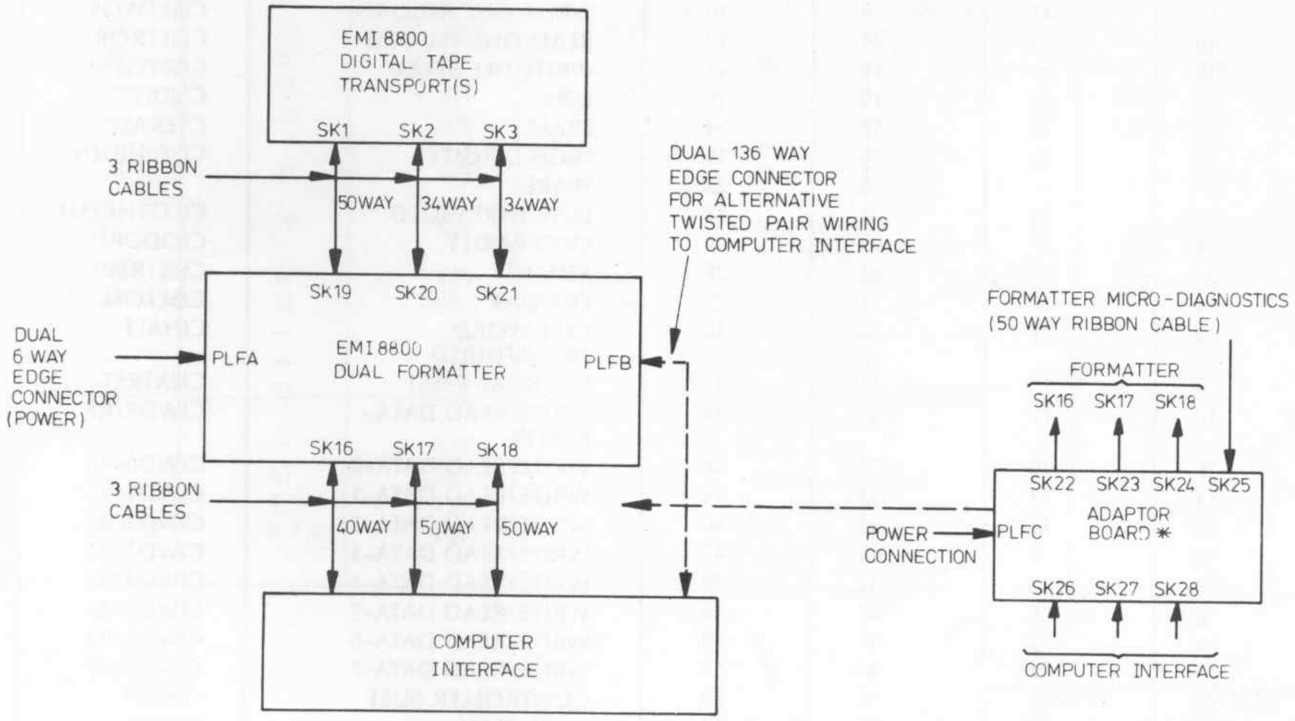
(v) Ensure that all connections are correctly made and secure. The formatter assembly is secured in position by two slide latches.

(w) Connect the formatter power cable (PLF) to the transport power unit.

(x) Enable connector validation (CV) for the formatter connections (refer to Section 9.3). Switch on transport check MONITOR indicator. Run micro-diagnostic tests as available.

(y) Switch off transport and connect formatter to interface.

(z) Perform system tests.



✻ ADDITIONAL ADAPTOR BOARD FOR FORMATTER MICRO-DIAGNOSTICS

FIG. 9.11 TRANSPORT-MOUNTED FORMATTER: INTERCONNECTIONS

9.6 INTERFACE

The EMI 8830 Dual Formatter provides two operational modes of computer/formatter interface.

(a) Interface Type 1: Industry-compatible.

(b) Interface Type 2: SE 8500 and SE 8600 compatible.

Interface Type 2 offers improved features and can optionally use bi-directional data lines. Either interface can be selected by means of a wire-wrap link on the formatter printed circuit board.

All interface lines are TTL low-true signals, using open collector drivers, SN7416 or equivalent (15V, 40mA), and are terminated at the receiver end by 220/330 ohm terminator networks. Either three ribbon cables (50 + 50 + 40 way) or twisted pair (dual 136 way 0.1 in pitch) can be used for interconnections.

Table 9.1 provides a complete list of the Input/Output–Formatter/Computer Interface connections.

TABLE 9.2
FORMATTER/COMPUTER INTERFACE CONNECTIONS

RIBBON CABLES (PL16, 17, 18)		DUAL 136 WAY (PLB)			
Live Pin	Ground Pin	Live Pin	Ground Pin	SIGNAL	MNEMONIC
PL18/50	PL18/45	1	6	FORMATTER ADDRESS	CIFAD
49	43	2	8	TRANSPORT SELECT	CISEL0
48	41	3	10	TRANSPORT SELECT	CISEL1
47	39	4	12	TRANSPORT SELECT	CISEL2
46	45	5	6	START COMMAND PULSE	CISTROBEC
44	43	7	8	SPACE REVERSE	CISETREV
42	41	9	10	WRITE ONE RECORD	CISETWOR
40	39	11	12	READ ONE RECORD	CISETROR
38	37	13	14	WRITE FILE MARK	CISETWFM
36	35	15	16	EDIT	CIEDIT
34	33	17	18	ERASE	CTERASE
32	33	19	18	HIGH DENSITY	CISELHIDEN
—	—	20	22	SPARE	—
30	29	21	22	LOW THRESHOLD	CILOTHRESH
28	27	23	24	ODD PARITY	CIODDPTY
26	25	25	26	REWIND	CISETREW
24	23	27	28	OFF LINE	CISETOFL
22	21	29	30	LAST WORD TRANSFERRED	CIHALT
20	19	31	32	EXTERNAL RESET	CIEXTRST
18	17	33	34	WRITE/READ DATA-PARITY	CIWDP/RP
16	15	35	36	WRITE/READ DATA–0	CIWD0/R0
14	13	37	38	WRITE/READ DATA–1	CIWD1/R1
12	11	39	40	WRITE/READ DATA–2	CIWD2/R2
10	9	41	42	WRITE/READ DATA–3	CIWD3/R3
8	7	43	44	WRITE/READ DATA–4	CIWD4/R4
6	5	45	46	WRITE/READ DATA–5	CIWD5/R5
4	3	47	48	WRITE/READ DATA–6	CIWD6/R6
2	1	49	50	WRITE/READ DATA–7	CIWD7/R7
PL17/50	PL17/49	51	52	CONTROLLER BUSY	CIBUSY
48	47	53	54	DATA BUSY	CIDBY
46	45	55	56	IDENTIFICATION STATUS/CHECK CHARACTER GATE	CIIDENT/CCG
44	43	57	58	PARITY ERROR	CIPTYERR
42	41	59	60	CORRECTED ERRORS	CICERS
40	39	61	62	FILE MARK	CIFM
38	39	63	62	READY	CIRDY
37	35	64	66	ON LINE	CIONLINE
36	35	65	66	REWINDING	CIRWDG
34	33	67	68	FILE PROTECTED	CIFPTD
32	31	69	70	LOAD POINT	CILDPT
30	29	71	72	END OF TAPE STATUS	CIEOTS
28	29	73	72	NON RETURN TO ZERO STATUS	CINRZ
27	25	74	76	7 TRACK STATUS	CI7T
26	25	75	76	WRITE STROBE	CIWS
24	23	77	78	READ STROBE/READ DATA STROBE	CIRSTR/RDS
22	21	79	80	READ DATA P*	CIRP*
20	19	81	82	READ DATA 0*	CIR0*
18	17	83	84	READ DATA 1*	CIR1*
16	15	85	86	READ DATA 2*	CIR2*
14	13	87	88	READ DATA 3*	CIR3*
12	11	89	90	READ DATA 4*	CIR4*

RIBBON CABLES (PL16, 17, 18)		DUAL 136 WAY (PLB)			
Live Pin	Ground Pin	Live Pin	Ground Pin	SIGNAL	MNEMONIC
10	9	91	92	READ DATA 5*	CIR5*
8	7	93	94	READ DATA 6*	CIR6*
6	5	95	96	READ DATA 7*	CIR7*
—	—	97	98	SPACE FORWARD	CISETFSR
4	3	99	100	STOP SPACE	CISTOPSPACE
2	1	101	102	FAST SEARCH	CIFASTSEARCH
PL16/40	PL16/39	103	104	DATA ACKNOWLEDGE	CIACK
38	37	105	106	ILLEGAL COMMAND	CIREJECT
36	35	107	108	REJECT PULSE	CIRJCT
34	33	109	110	READ ONE RECORD	CIROR
32	31	111	112	WRITE ONE RECORD	CIWOR
30	29	113	114	TIMING ERROR	CITMERR
28	27	115	116	READ STROBE	CIRSTROBE
26	25	117	118	TAPE MONITOR	CITM
24	23	119	120	READ CLOCK ACTIVITY SENSE	CIRCAS
22	21	121	122	DATA TRANSFER REQUEST	CIDATAREQ
20	19	123	124	WRITE MOST SIGNIFICANT BYTE	CIWMSB
18	17	125	126	CHECK WORD COUNT	CICHWDCNT
16	15	127	128	TEST READ	CITREAD
—	—	129	—	SPARE	—
—	—	130	—	SPARE	—
14	13	131	—	COMPUTER POWER MONITOR	—
—	—	132	—	SPARE	—
12	11	133	134	LOAD ON LINE	CILOL
2,4	1,3	135	—	SPARE	—
6,8,10	5,7,9	136	—	SPARE	—